

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns our own opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

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CONTENTS

EDITORIAL:

The Proposed Increase in Freight Rates... 625
The Subway Extension 625
The Strength of Culvert Pipe 626
Piece Work and Premium Work 626
General Electric Company 628
New Publications 628

ILLUSTRATED:

Raritan River Bridge; N. Y. & L. B. R.R. 630
Six Great Cantilever Bridges 635
Single-Phase Equipment for the Richmond & Chesapeake Bay 637
Concrete Coal Trestle and Ash Handling Plant 640
Construction of the St. Michel Station of the Paris Metropolitan Subway 642
Ten-Wheel Passenger Locomotive for the Frisco 647
An Engineering Department Filing System 648

CONTRIBUTIONS:

Written Examinations on Train Rules... 628
Young and Inexperienced Telegraphers... 628

MISCELLANEOUS:

Refrigeration in Transportation of Fruit 629
Training Engineers—Prussian State R.Rs 629
Existing and Projected Railroads in China 633
Picked Up on the Road 636
Traffic Arrangements in Japan 636
Car Surpluses and Shortages to April 15. 638
The Ocean Carrier 638
Working of the Massachusetts Stock Law 643
Freight Car Balance and Performance for December, 1907. 646
Foreign Railroad Notes: 646
Würtemberg State Railroads } 633
The Cape-to-Cairo Again }
Signal Horns in Prussia }

German Railroad Union 636
Chinese Railroads }
Railroad Ferry between Germany and Sweden } 642
Stock Raising in Siberia }
Railroad Terminals at Copenhagen.... 648

GENERAL NEWS SECTION:

Notes 649
Interstate Commerce Commission Rulings 651
Trade Catalogues 652
Obituary 652
Meetings and Announcements 653
Elections and Appointments 653
Locomotive Building 654
Car Building 654
Railroad Structures 654
Railroad Construction 654
Railroad Corporation News 656

VOL. XLIV., No. 19.

FRIDAY, MAY 8, 1908.

Being content with loose, inaccurate and incomplete knowledge on important subjects is said to be one of the economic sins of the American people; and we are certainly open to the charge. An illustrative example may be found in the newspaper statements concerning the proposed general advance in freight rates. A Washington despatch of May 2 says that "the anticipated general increase in railroad freight rates seems likely soon to be made. The railroads of the southeastern territory have filed tariffs, effective June 1, increasing freight rates on fresh meats from 3 cents to 10 cents per 100 lbs. This will mean much to the consumers, as it will probably result in an increase of 1 cent a pound on low grades of meats, and perhaps as much as 2 cents a pound on the select cuts. This advance is intended as a feeler of public sentiment, with a view to making a general raise in rates on all commodities." The one statement in this item that will be remembered by the majority of readers is that meat is going to cost 2 cents more a pound—because of the exactions of the railroads. The highest proposed advance in freight rates is one-tenth of one cent a pound (and the lowest is three-hundredths of a cent), so that $1\frac{9}{10}$ cents of the 2 cents added by the retailer is for his own benefit; but that is a point which the reader does not notice. Probably the reporter is quite innocent, for if he saw the absurdity of the statement he would modify it, no doubt. In modifying the article he could lengthen it and thus increase his pay. It is all right for the railroads to put out feelers at proper times and places, but evidently the retail meat trade is not a favorable field in which to try the experiment; the art of raising prices on the strength of a false issue is too well known there.

There is one great objection to feelers just at present, though theoretically they may seem to be justified; it is a time when every man is engrossed with his own internal feelings—intense feelings—engendered by loss of business or fear of loss; and external things are likely to have no influence on him. If he gives a thought to freight rates at all, it will be to observe within himself that all other commodities are falling in price, and that the railroads must be fools. Wages controlled by labor unions, and the prices of some things controlled by powerful corporations, are, indeed, kept at high levels; but the "average man" does not consider these; he thinks more of those wage rates and commodity prices which are

ruled by the law of supply and demand. Even if a railroad does feel justified in putting out a feeler, it is probable that a very small and very mild one will be the best. It will be at least two or three months before the rate clerks can prepare tariffs for the general advance that is talked of, and another month will be required for the statutory notice; and to feel the public pulse three months before the surgical operation is to be performed may be worse than useless. In that period there will be time for many changes to occur. One change may be important; the railroad presidents may change their minds as to whether an increase can be agreed on. They may conclude that the rates which cannot possibly be raised are so numerous as to make a general increase wholly impracticable. There is one other contingency: nearly all of these proposed changes are in interstate rates, and those presidents who have conferred about them may be imprisoned for violation of the anti-trust law!

The establishment of a through subway connection between Atlantic avenue, Brooklyn, and the main line on Manhattan island, has an importance far beyond that of its immediate benefits. Heretofore, the time required for transit to the remote parts of Brooklyn and to Long Island points has been so great that development was slow; a densely populated territory had to be traversed and a river crossed. But the time-saving of the subway route is tremendous. The Long Island commuter to Wall street saves some twenty minutes each way; nearly or quite three-quarters of an hour a day; the man who sleeps in the Flatbush part of Brooklyn and works in Manhattan saves more than that. Since suburban residence around great cities is determined largely by two factors—ground rent and time of transit—it is obvious that the great empty areas east and northeast of Brooklyn are now going to have their chance, and that a great many city workers are going to have more light and air than they have ever before been able to have at the same rent, without increasing the time length of their daily journey. The position of the Interborough Rapid Transit Company as a beneficiary of this travel is most interesting. By giving a service unparalleled in all the world, it gets a maximum haul in both directions at the same time during the rush hours. The southbound train that discharges a mob of passengers at Fulton street and at Wall street at 8.30 a.m. leaves Atlantic avenue 18 minutes later, northbound, with the cars

crowded; that is to say, the same train discharges two maximum loads at Wall street in a little over thirty minutes. The Long Island Railroad is almost as fortunate as the Interborough, though not for the same reason. For years it has been spending great sums on its Atlantic avenue improvement, taking the tracks off grade, where rapid service was impossible, and building a splendid tunnel and elevated structure. Now the Interborough brings it the business for this line, and will doubtless continue to bring increasing amounts of it every year, changing the Long Island from a June-to-October road to a January-to-January one, and building up a steady suburban traffic that will tend to push out further and further along the main lines. Last but not least is the tribute the subway extension brings to construction by private capital. The Interborough contracted to open its line on May 1, and it opened it on May 1, in spite of all the construction difficulties that arose. When the city undertook the vastly simpler task of operating the Staten Island Ferry its new boats were two seasons late, its Staten Island terminal three seasons late, and its New York terminal is four seasons late at time of writing, and gives abundant promise of another year.

THE STRENGTH OF CULVERT PIPE.

There is little published information regarding the stresses to which culvert pipes in railroad embankments are subjected by the conditions of bedding and earth pressure. The ordinary cast iron water pipe, generally used for this purpose, is designed merely to withstand the internal hydrostatic pressures encountered in service, since in most cases this gives pipes of the desired rigidity. The external stresses have heretofore been regarded as indeterminate, authorities agreeing that there seemed no satisfactory way of computing them. For that reason the tests which have been made at the University of Illinois on both cast iron and reinforced concrete culvert pipe are of special interest and value in throwing light on this subject.

The experiences of different roads with cast iron culvert pipe do not seem to be uniform, some claiming to have little or no trouble, while others have a great many breakages. We have heard of one road which made it a rule not to use cast iron pipe in banks under 10 ft. or over 25 ft. high. But the real conditions to be observed are careful bedding and tamping to assure as even a distribution as possible of the bearing pressures. This may be further helped by shoring up the barrels of the sections to equalize the support, and some roads do this.

Proper trenching is presupposed. Engineers have reported pipes breaking without apparent adequate cause. With the ordinary rectangular-bottom trench it is harder to equalize the pressures than where the bottom is curved and the material is well tamped around and under the pipe. Tamping is very necessary; otherwise, the earth immediately under the bottom element is unduly compressed and concentrated loading results. There is a record of some 48-in. cast iron pipe $1\frac{1}{4}$ in. thick being flattened $\frac{1}{4}$ in. under an 8-ft. fill, and more than $\frac{1}{10}$ in. under a 22-ft. fill. Pipe of these dimensions distorts slightly from its own weight, careful measurements of lengths lying on the ground, and therefore having one line of support, showing a difference between the vertical and horizontal diameters of over $\frac{1}{10}$ in. With an increase of the thickness to $1\frac{1}{2}$ in. this distortion was not noticeable.

The results of the University of Illinois' tests were presented in condensed form by Professor Talbot, of that university, in a paper presented at the April 15 meeting of the Western Society of Engineers. In addition to the main tests, the investigation included a lot of auxiliary tests to give data on the action of pipes in other methods of testing. In discussing the mechanics of pipes and rings subject to external pressure, formulas were developed for the bending moments under certain assumed conditions of loading. These are intended only to serve as a basis for calculations, since the assumed conditions do not represent accurately the conditions of bedding and loading found in practice. The nature and extent of the possible or probable variations from the assumed conditions were discussed, however, and the effects of such divergence considered. In the main tests a special testing apparatus was used. It included a box of stiff construction, the pipes being embedded in sand in this box and the load applied through a saddle resting on the sand cushion. Nine cast iron and five reinforced concrete culvert pipes were tested. Both light and medium weights in the cast iron pipes were used. Four were of 36 in. diameter, two being 1 in. and two $1\frac{1}{4}$ in. thick. Five were of 48 in. diameter, three being $1\frac{1}{4}$ in. and two $1\frac{1}{2}$ in. thick. In the order given, the average breaking loads were, in

pounds per lineal foot, 24,750 lbs., 37,250 lbs., 28,800 lbs. and 51,950 lbs.

The reinforced concrete culvert pipes were the designs of the Chicago, Burlington & Quincy Railroad, described in the *Railroad Gazette*, October 12, 1906, but improved in a number of respects since that time. All of the pipes were 3 in. thick, the difference being in the method of reinforcing. The load at first crack, in pounds per lineal foot, varied from 4,950 to 10,960 lbs. The maximum load varied from 23,800 to 31,500 lbs. The data does not indicate the method of reinforcing corresponding with these figures. It should be mentioned regarding these pipes that two of them were frankly experimental, and in one, for some reason unknown, the concrete proved poor. Only two of the five, therefore, were representative. We assume that it was these two that showed the highest loads.

One notable difference between the reinforced concrete and cast iron pipe is that while the latter collapse completely under a maximum dead load, the action of the reinforced concrete pipe is quite different. Final failure is through crushing of the concrete, and after passing the critical load there is a large margin of strength available in an emergency. Reinforced concrete pipe can be made as strong as cast iron pipe simply by increasing the thickness of the concrete, the gain being proportional to the square of the diameter. The object with this pipe, however, should be simply to make it strong enough to stand the service when carefully and properly laid and thus save as much as possible over the cast iron pipe. Another consideration is the possible saving in transportation costs, which are sometimes excessive on new work. We have heard of one case recently where 60 cents per ton mile was paid for testing cast iron culvert pipe for a new line which was being built through very rugged country. Reinforced concrete pipe can be made at or near the site, saving this considerable additional expense.

PIECE WORK AND PREMIUM WORK.

For just about ten years, or from 1898 through the greater part of 1907, the railroads of the country had so much work to do that the problem of getting it done was paramount, and economy and efficiency had often to be subordinated. Following the brief let-up in the fall of 1903 and the early part of 1904, the urgency was greatest in the last three years of the period of great prosperity, and one very unfortunate result of this urgency was the lessened control of the general manager, the superintendent, the division superintendent and the master mechanic over their men. When men are looking for jobs they are very amenable to discipline; when jobs are looking for men discipline is an exceedingly hard thing to enforce, and the practical application of this principle was, as everybody knows, that operating costs got pretty well out of hand last year. The day's work was small, the price high, the quality not good. Estimates of the average loss of efficiency per unit of labor ranged all the way from 15 to 50 per cent. or even higher, while wages had increased from 10 to 35 per cent. within two years.

The great economies now being practiced in all railroad departments are not due primarily to the increase of individual efficiency; they are due to rigorous weeding out of unnecessary labor—even of labor which is going to be necessary again very soon—to cessation of all except the most urgent work, and, to a certain extent, to reduced costs of material, principally lumber; but the individual efficiency is there, too, to an extent that it has not been for a decade, and the output of work along all lines where it is not strictly measured by rule is astonishingly great, per unit of labor. The place where it has been most difficult to put economy on any sort of basis that gives signs of permanency is in the shops. Wage reductions have been very difficult to make, with the result that a great many men have lost their jobs entirely who could have been retained to mutual advantage if a small general scaling down could have been effected.

It is very natural that it should have occurred to a great many master mechanics and general managers that the times were favorable for an extension of the piece work system or the premium system of work. Piece work and premium work have, on the whole, succeeded very well where they have been firmly established, but there has been the greatest difficulty in establishing them. The attitude of the mechanics' union has been not to refuse work in shops where piece work was already established, but to fight with the greatest bitterness new extensions of the principle. The reasons for this are very plain. When it comes to a show-down, union

labor is unable to drive piece work and premium work out of its present strongholds, and it does not care to make the attempt, but every extension of the principle means more workmen who see a tangible reason why they should not be bound to the standard of the dullest—and labor and trade union strength, in the last analysis, rests on the standard of the dullest. It may truly be said, therefore, that piece work and premium work have two very important uses which are clearly defined from one another; they lessen manufacturing cost and they tighten the hold which the general manager or the master mechanic has over his men, not by imposing hard conditions, but by granting very easy ones, and by showing a workman, in terms of dollars and cents, that when he is doing good work for his company he is doing good work for himself, and that if he cares to be a sluggard the cost is borne by him and not by his company.

The strength of the piece work plan and of the premium plan alike is on the surface; the weakness of them lies in the violence which they do to human nature, particularly during the critical period when they are being discussed, but are not in operation, and the labor organizers have been quick to take advantage of the arguments which appeal most quickly to human nature. Unfortunately, in some cases, these arguments have been entirely true. The standard labor union argument against piece work is that the faster a man works the faster he has to work, and if there are three extremely able machinists in a shop of twenty, all working on piece work, in the long run there will be three men earning standard wage and 17 below, instead of 17 men earning standard wage and three men above standard.

Let us frankly admit that this has sometimes been true, or at least that the principle of it has sometimes been found, although the case as stated is exaggerated; but it has not generally been true. The three pacemakers have generally been able to earn a good deal more than they could have earned on the day wage plan, and the rest of the shop has also generally been able to increase its earning power, while the really useless men have been eliminated; but it has been necessary to handle the shop with the greatest care, the greatest skill, and the greatest fairness, to bring this about. When a shop is first put on piece work the master mechanic generally does a little quiet tallying for a few days or a few weeks and gets a good line on the normal average output of the ordinary man, and it is not difficult to get a fair average price out of the figure thus obtained. The difficulty has lain in convincing the workmen that it was a fair price. The premium or bonus plan undoubtedly has an advantage that psychology affords it in this connection. Under the normal workings of the premium plan the workman has his regular, accustomed day wage anyhow, and if he is disposed to accelerate he can earn a premium on the output above an established standard. If he cannot earn a premium, no harm is done; if he can, he does not damage his neighbor even in theory, because his neighbor's guaranteed wage is not affected thereby.

To ascertain the progress of the piece work and premium work movement we recently made inquiry of a large number of railroads, asking them whether or not they were using these methods and how the plan was working. Most of the officers who replied to our inquiry felt that the subject was a delicate one and did not wish to be quoted, either by name or by the name of their company, for the opinions which they expressed. It is possible without violation of confidence, however, to point out in a general way some of the tendencies which clearly appear from the correspondence.

It is curious and interesting that out of fifty replies, gathered from all parts of the country, and representing small individual railroads and large railroad systems alike, the division between those who use piece work or premium work, in whole or in part, and those who do not, was exactly even—25 to 25. Of the respondents who do not make use of piece work ten may be classed as individual roads, relatively small, and fifteen as railroad systems, relatively large. Of the twenty-five companies using piece work or premium work in whole or in part, eighteen are large roads and seven are small roads. It has been substantially the unanimous experience of piece work and premium work shops that car repairs were most easily placed upon the unit basis. In most cases locomotive repairs are also done on this basis, but one or two roads reply that they have been unable to make the change in the locomotive department. Yet difficulties arise in connection with repair work which are found to a much less degree in original manufacture. Where the employee makes only one article as his whole occupation, it is comparatively easy to adjust his pay; where any question arises as to the amount of time it ought to take to do the job, the uncertainty is

always very unsatisfactory to the men. Thus in the repairs of freight cars a man may receive a given amount for changing a drawbar, but if the weather conditions are against him, or the make of the drawbar is peculiar, he is unable to make as much as his neighbor who is in better luck. The skilled mechanics on one road make objections on the ground that piece work and premium work alike restrict and limit a man to doing one thing, thereby narrowing his efficiency and limiting his ability. Some of the competent mechanics on this road, who have served their time and know that they are efficient workmen, feel strongly that they cannot afford to restrict their fields of work by confining their efforts to one line or to one machine.

The human nature objection to piece work—that the few men in a shop who can earn abnormally high wages are disliked and distrusted by all the others—is probably the most serious obstacle of all and requires much tact and fairness on the part of the master mechanic. As one superintendent of machinery puts it: "If the piece work price is high enough for the poor workman to make fair wages, the good workman will make such high wages that it is unsatisfactory to the other men."

These difficulties are all tangible, and the obvious chance which the shop foreman or the master mechanic has to discriminate between men and between trades by the piece price which he establishes is also obvious, consequently these objections have been urged so strongly that many roads have tried entirely without success to put some unit pay plan into effect, while others would like to try, but have given it up as hopeless without an attempt. In view of these things it is most interesting to trace out the actual workings of the system. (For simplicity we are now grouping piece work and premium work together, although the principle is radically different. A separation of the two will be made further on in the discussion.) The following list is taken direct from our replies and shows the different kinds of work which different roads specify they are doing on the piece or premium basis:

Turning car axles	Switch and frog work in forge shops
Boring car wheels	Buffing
Moulding	Part of tinsmith work
Some work in blacksmith shop	Coach cleaners
General repairs to locomotives	Brass cleaners
Work in paint shops	Caboose shop
Car cleaning	Air-brake shop
Wiping	General locomotive repair work
Upholstering	New car building
Bolt making	New locomotive building
Steel car repairs	Certain machine tool work

We asked specifically how the earnings of the men and the economy to the road compared under the two systems, and we have tabulated the specific replies to this very important question as follows:

Road	Men earn.	Saving to company.
A.....	55 per cent. more.	45 per cent.
" B.....	1/4 to 1/2 more.	Output very much increased
" C.....	12 to 15 per cent. more.	15 per cent.
" D.....	25 per cent. more.	25 per cent.
" E.....	25 to 35 per cent. more.
" F.....	15 to 25 per cent. more.	20 per cent.
" G.....	33 1/4 per cent. more.	50 per cent.
" H.....	Some men do not make their day rate; others on the same class of work make from 5 per cent. to 18 per cent. above it.	

One large road gives a detail statement as follows: For the 1901 fiscal year, during which year all the company's shops doing general repair work turned out 282 locomotives, the cost of labor was \$244,706. During the fiscal year 1907, when the company's shops turned out 491 locomotives, the cost of labor was \$287,953; that is to say, the number of locomotives increased 74 1/2 per cent. in 1907 over 1901, while the cost of labor increased only 17.7 per cent. This change was not brought about entirely by the piece work system, since standardization of power, new and more improved machinery and better shop facilities also helped, but the principal item for the increased output and relatively reduced cost was the change from day work to piece work during the period. It is noteworthy in this connection that the average weight of the engines increased 66 per cent. during the period.

Another road gives the following comparative statement of employees working at piece work and at day rate in March, 1908:

Comparative Statement of Employees Working Piece Work and at Day Rate, March, 1908.

Department.	Total amount earned		No. men who worked at—		Average hourly rate paid for—		Efficiency over day work, per cent.
	Piece work.	Hourly rate.	Piece	Hourly	P. W., cts.	D. W., cts.	
Erecting	\$1,051.31	\$6,647.28	93	93	29.88	22.36	33.6
Machine	4,729.80	4,773.48	76	106	38.50	22.34	72.3
Blacksmith	3,060.24	2,137.85	72	26	34.33	22.13	55.1
Boiler	1,633.56	5,117.24	54	99	33.50	21.14	58.5
Air brake	1,176.92	1,945.20	16	40	44.25	22.81	94.0
Tender	854.62	203.59	21	5	23.52	18.05	30.3
Total	\$12,506.45	\$20,824.64	332	369	34.00	21.47	58.3

The foregoing outline of the piece work and premium work

problem, the present status of it and the economies to be effected by it must be regarded only as preliminary. We desire to enlarge the discussion, particularly with reference to the objections, good and bad, brought forward by labor when it is proposed to introduce piece work and to the best ways of meeting these objections. We shall welcome additional correspondence on this subject.

General Electric Company.

The sixteenth annual report of the General Electric Company, for the year ending January 31, 1908, shows gross profits of \$6,586,653, after deducting all patent, general and miscellaneous expenses and allowances for depreciation and losses, and writing off \$3,745,989 from factory plants. After paying \$5,183,614 in dividends, a balance of \$1,403,039 was carried to surplus account, bringing up the total surplus as of January 31, 1908, to \$16,513,836. Last year the company's profits were \$8,427,843, but the actual sales billed in the 1908 year amounted to \$70,977,168, as against \$60,071,883 in 1907.

The reports of the General Electric Company have for some time stood as an example of the way an industrial company ought to handle its finances and tell the public about them. The picture of the business year is made perfectly plain, and there are no frills in the asset and inventory values. The company has naturally had to make very heavy expenditures in the purchase of patents and will presumably have to continue doing so for many years to come in order to keep abreast with the best electrical science of the day. The value of its patents, franchises and good will account stood on the books of the company at \$8,000,000 on January 31, 1897. On January 31, 1907, this account had been reduced to \$1 by progressive writings off, charged to the current operating surpluses. During the 1908 fiscal year the company spent \$872,346 in acquiring other patents, licenses under patents and in patent litigation, and promptly charged it off to profit and loss, so that the company's patents, franchises and good will still stand on the books at \$1. This is an admirable record, and the manner in which the book values of the factory plants have been written off, year by year, is no less admirable. Starting in 1893 with plants at Schenectady, Lynn and Harrison, valued on the company's books at \$3,958,528, the company during the subsequent 15 years to date has spent \$30,892,486 on expenditures and betterments to its plants, making a total of \$34,851,014, from which 22 millions have been written off for depreciation and replacement, leaving the book value of the plants, on January 31 of the current year, at \$12,900,000, entirely free from mortgage or other lien; an average valuation of but \$2 per square foot of floor space, including land, buildings, power houses, machinery, tools and all other equipment.

The company on January 31, 1908, had no floating debt at all and had only \$1,759,517 in accounts payable, as against \$29,857,727 of notes and accounts receivable. It reported \$12,250,721 of cash, as against \$3,910,709 in January, 1907, the difference being in considerable part accounted for by the funds derived during the year by the issue of \$12,872,750 of 5 per cent. 10-year convertible debentures and by the sale of \$1,594,600 of new capital stock. Thus the company's cash position is excellent, as it is highly important that it should be. Collections of its very large accounts receivable will presumably be slow in dull times, although the company actually collected some \$66,000,000 from notes and accounts receivable during the year, as against \$53,000,000 collected in the 1907 fiscal year. All but \$3,544,586 of the \$27,094,348, representing the face amount of notes and accounts receivable on January 31, 1907, was collected during the year.

Among the important orders received during the year were: One hundred and sixty-five-mile transmission for Great Western Power Company, California; Detroit tunnel electrification; Cascade tunnel electrification, Great Northern Railway; electrification of Southern Pacific suburban lines in California; electrification of Hudson tunnels; additional equipment for West Jersey & Sea Shore, and for New York City terminal of the New York Central.

The following table shows the company's sales and orders for the last six years:

	Sales billed.	Orders received.		Sales billed.	Orders received.
1908....	\$70,977,168	\$59,301,040	1905....	\$39,231,328	\$35,094,807
1907....	60,071,883	60,483,659	1904....	41,699,617	39,060,038
1906....	43,146,902	50,044,272	1903....	36,685,598	39,944,454

NEW PUBLICATIONS.

Locomotive Breakdowns, Emergencies and Their Remedies. By Geo. L. Fowler. Revised and enlarged by Wm. W. Wood. New York: Norman W. Henley, Publishing Co. Fifth edition, 266 pages, 4½ in. by 6¾ in.; 90 illustrations; semi-flexible cover. Price, \$1.00.

This is a revision and enlargement of a book that was first published in 1903 and was reviewed in the *Railroad Gazette* for November 27, of that year. The present revision consists of the addition of chapters on the Walschaerts valve gear and the Pyle-National headlight, the intercalation of a number of questions into the chap-

ter on injector troubles, a complete revision and rewriting of the chapter on air-brake troubles and the omission of the one on the first aid to be given to the injured. The book is valuable and convenient.

American Railway Association, Proceedings, Vol. IV., 1903-1906. New York: Published by the Association, 24 Park Place. Price, \$5.00.

This volume of the Proceedings brings the record down to and including October 24, 1906. It consists of 737 pages and, as in former volumes, the index is very full, serving in some cases to make unnecessary a reference to the text. For example, under the head of Car Service Committee's reports, the index item consists of a two-page abstract of the things done at the several meetings which were held in the four years covered by this volume. All of the doings of the association in connection with the International Railway Congress at Washington in 1905 are here recorded. The volume also contains the Rules for Determining the Educational and Physical Qualifications of Employees, which were reported in September, 1904, and again in April, 1905; also all the revisions of the standard code which were adopted in the four years named.

CONTRIBUTIONS

Written Examinations on Train Rules.

New York, May 4th, 1908.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your editorial on "Written Examinations on Train Rules" in your issue of April 24, 1908, you state "we understand that this is the first interurban road to follow this plan." The writer begs to call your attention that complete written examinations were required of all trainmen by the Rochester & Eastern Rapid Railway Company more than two years ago.

J. H. PARDEE,
Operating Manager; J. G. White & Co.

Young and Inexperienced Telegraphers.

TO THE EDITOR OF THE RAILROAD GAZETTE:

According to a press despatch of April 28 the Railroad Commissioners of New Hampshire blame the Federal government for a butting collision of freight trains which happened near Haverhill, in that state, on March 20, and in which five men were killed and two others injured. Because of the Federal statute the road "had to hire young and inexperienced operators." The collision was due to the dropping of the word "East" from a telegraphic order directing the trains to meet at East Haverhill, making it read "Haverhill." The trains met at Haverhill, running 30 miles an hour.

I do not know whether this is a true report of the Commissioner's opinion but there is no doubt that many citizens do accept the view set forth, especially where an official body, competent or incompetent, promulgated it as a reasonable one; therefore I ask you to take a line or two to show its absurdity. Assuming, that good operators really are unobtainable, how is it that the New Hampshire Commissioners did not earlier report the fact to Washington? Congress allowed a year in which to prepare for the law, but no protest was made until the year had nearly expired. And if poor operators have to be employed is it rational to run trains in exactly the same way as though the offices were properly manned? It would seem more reasonable from the standpoint of safety of life and limb to reduce the speeds of trains if the operators are not well trained; or to run trains entirely by time-table rules as we used to do, and not to try to use the telegraph. Suppose the Federal government had ordered the railroads to dismiss their bridge inspectors and boiler inspectors and trust to luck for safe passage over bridges and for immunity from boiler explosions; would a sensible New Hampshire railroad man obey the order and continue trusting his life on his trains? Of course not. He would either disobey the order or else cease running trains. If the Federal government requires impossibilities why not accept the situation, and "lay down"? Then Congressmen might perhaps see their folly.

D. W. C.

[If such a dilemma really exists, the superintendent who aims to give safe service is indeed "up against" the question of going back to the methods of 1850. More likely, however, the story is only a hodge podge of generalities. We cannot class it as "sensational" because operators who omit words from orders, and dispatchers who fail to detect errors in operators' repetitions have been heard of too frequently in the past. If "young and inexperienced" persons are the only ones available as telegraphers and if after a year no remedy is discoverable, it would seem wise to use telephones, as a number of railroads have done. Surely, an established railroad is not reduced to the necessity of employing "young and inexperienced persons" as station agents. But why have not the New Hampshire Commissioners long since secured the adop-

tion of the block system in that state? Under that method of regulating trains "young and inexperienced" persons are far less likely to make fatal errors.—EDITOR.]

Refrigeration in the Transportation of Fruit.

BY JOSEPH H. HART.

The transportation of fruit from California and the South constitutes an ever increasing phase of railroad freight. The question of the preservation of this fruit during transit is one that has been solved in a general way with more or less success. At present, the greater part of the fruit is shipped under two general systems, namely, ventilation and icing in the winter and early spring when temperatures are low. The fruit is shipped in refrigerating cars with the ventilators left open, so that currents of air circulate through the car when in motion. Later in the season when the temperatures are higher, ventilators are closed and the tanks at the end of the cars kept filled with ice. Both of these methods are subject to considerable objection and are very inefficient from an economic viewpoint, at least in comparison to the possibilities in this line. In order to supply adequate ventilation the cars are never completely filled and the ice tank at the end of the car represents so much waste space. When ice is used the fruit undergoes a gradual cooling process which sometimes takes as much as seven days to lower the temperature of the fruit to that at which decay is prevented. Thus the ice must not only do the duty of cooling the fruit but also maintain low temperatures during transit. At least this is the condition in theory, while in actual practice much of the fruit is merely undergoing initial cooling during the entire period of transportation.

In order to determine the bearing of the different methods of handling and shipping and also of the effect of delayed shipment upon the losses by decay and the keeping quality of the fruit after arrival at the market a comprehensive series of shipping experiments have been conducted in California and elsewhere by the United States Agricultural Department and some interesting results have been attained. The results of these experiments are quite fully set forth in a bulletin which is in process of publication by the Bureau of Plant Industry. However, a number of railroads and individual shipping associations have conducted a series of similar experiments which have equal bearing upon the conditions and these are not fully stated.

Pre-cooling of the fruit has been the line upon which all these developments and experiments have been attempted. Oranges shipped from California have been pre-cooled in the government experiment plant in Los Angeles, and the Santa Fe interests and Southern Pacific system have also erected plants of the pre-cooling type. The chief difficulty in this process of pre-cooling is in the time which must elapse in order to accomplish this. Generally from 18 to 24 hours is required to cool oranges or other fruit in bulk to a temperature at which decay is impossible, and even under these circumstances portions of the fruit are cooled considerably below the danger point at which freezing occurs. The railroads, however, and private interests as well, are going ahead with pre-cooling plants, and it undoubtedly will prove a commercial success not only on account of the saving in fruit due to diminution in decay and the better quality of the shipment after transit but on account of a large number of other factors which enter as well in limiting the efficiency of the transportation process.

Thus pre-cooled fruit requires less ice for its transportation since the sole duty of the ice under these circumstances is to maintain the initial temperature. It is even advocated that pre-cooling be used during the period where ventilation is the prevailing method and icing is not necessary. With pre-cooled fruit, packing can be much closer and ventilation is not nearly as necessary and need not be as thorough. Thus recently oranges have been shipped to New York City in car lots from 549 to 584 boxes each, an increase of more than 40 per cent. over the standard car of 384 boxes. This increase in capacity is due not only to closer packing but higher packing as well. In many refrigerator cars during the icing period it is impossible to fill the car on the top tiers without very considerable loss due to the fact that the temperature is much higher at all times in the top of the car than in the bottom. With pre-cooling the average rise in temperature at the top of the car is from 8 to 10 deg. and the bottom about one-half of this. Even with this rise in temperature the average temperature of the fruit on arrival is usually lower than it is in a car under standard icing under the same conditions of weather and transit.

This development of pre-cooling fruit before shipment is undoubtedly bound to be of increased importance in the near future. The saving in ice for icing in space for shipment, in inefficient labor in handling, and in improved quality of the shipment after transit, are the main features which determine this result. With this question of pre-cooling as one apt to become important, the question of methods of pre-cooling and a determination in regard to the agent for the performance of this duty are of interest. Un-

doubtedly the railroads in supplying refrigeration for shipment do not keep the material cooled during transit. The effect of icing is merely to produce initial cooling toward the end of the transit period. The advantages of pre-cooling may be such in the line of space and increased efficiency for the railroad that they may undertake this duty for their own individual interest. The question of time involved, however, during this process is one of very great importance and its solution is dependent upon a number of factors which may or may not limit the efficiency. Thus, to-day pre-cooling is accomplished either before packing or after installation in cars. The Southern California system has erected in central California a plant of the car cooling type. This plant is arranged to cool one car at a time by circulating cold air through the car. It was completed too late this season to be used for extended experiments. A few experiments have been conducted by the Department of Agriculture here in the pre-cooling of grapes but considerable difficulty has been encountered in the cooling of the grapes at the centers of the packages. The Santa Fe line has erected a plant of the warehouse type to which the fruit is brought and unloaded for cooling. This plant has a capacity of six or eight carloads and is provided with an air circulation system. The government plant at Los Angeles is of the car cooling type, with air conduits and fans capable of handling large quantities of air, and is similar in many respects to the installation by the United Fruit Co. at Springfield, Mo., installed for the refrigeration of the bananas during transit. An average of 18 hours is generally required for cooling shipments already installed in cars by even the best methods of refrigeration. More inefficient methods easily require an increase in time of 50 per cent. over this amount.

The cooling of fruit before packing will probably not be accomplished without considerable development in refrigeration practice and the design of automatic handling machinery, since employees object to working in the low temperatures in packing. Thus, if pre-cooling is to come under present conditions, it must be accomplished either in car units or package units. The question of adequate refrigeration is essentially one for refrigerating engineers and presents interesting new developments, although ones not involving new principles. Again, from the railroad or shipper's point of view must be considered the first cost of installation of a refrigerating machine in consideration of the fact that this latter is used only a small fraction of the time throughout the entire year. The question will be in regard to the installation of these plants, whether a series of small plants will be more efficient in actual practice than the shipment of the fruit directly to large central station pre-cooling plants or whether possibly the refrigeration can be sent by pipe line to a number of surrounding sections. A number of interesting developments and possibilities present themselves to both the railroad manager and the refrigerating engineer in this development. The possibility of utilizing ice plants for this system is of interest to the railroads, since natural ice is in the majority of cases the chief source of refrigeration in this field, even though mechanical refrigeration can be accomplished very efficiently and with a distinct advantage to the railroads. Again, not only is variability of supply for transportation an important factor in railroad consideration, but often personal interests and weather conditions affect the demand greatly. Thus in the last season the Santa Fe system was compelled to carry 20,000 tons of ice nearly 1,000 miles to take care of an increase in the shipment by icing of about 10 per cent. of the citron crop. This increase did not represent increase in output really but was merely an increase in the percentage of the citron crop supplied to the railroad for shipment under standard icing conditions.

Thus the problem to the railroad is an essentially complicated one; not only cannot the demand for refrigeration be accurately foretold from crop conditions but immediate weather conditions enter as well. The requirement for railroad refrigeration is an extremely mobile and transportable refrigerating plant embodying all the increased efficiency of the mechanical refrigeration in the production of the icing but one capable of operating in large units with great efficiency and under what are often regarded as inadequate conditions by the refrigerating engineer. Whether this problem will be satisfactorily solved from the railroad viewpoint is a matter for the future alone to decide.

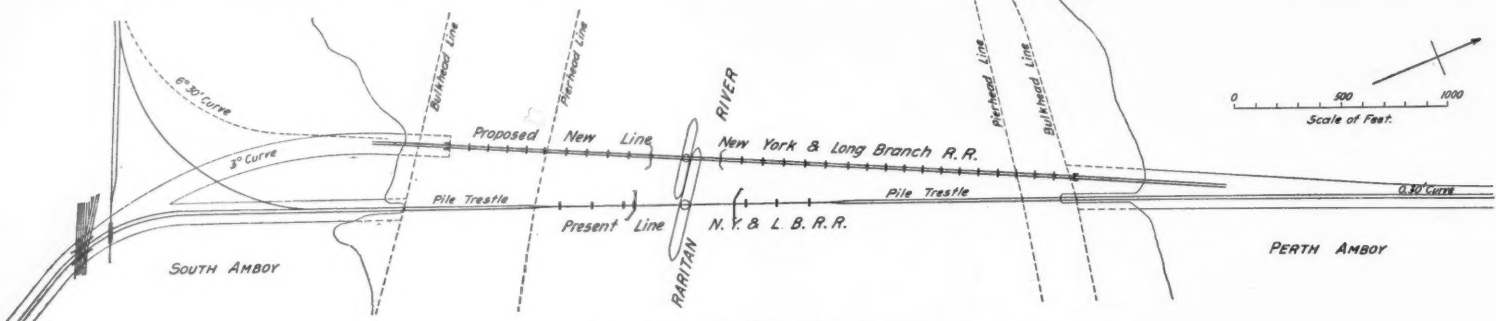
Training Enginemen—Prussian State Railroads.

The Prussian State Railroads had a rule which required a preliminary training as machinist or smith of all those who were permitted to become locomotive firemen. As an experiment, trial was made of approved laborers who had no trade, especially of men who had had experience in cleaning the engines. This has been so satisfactory that the practice will be continued; but such firemen are not eligible to promotion as locomotive enginemen, for whom the shop experience continues to be obligatory. And it is only after eight years' service on the railroad that laborers may be made firemen.

Raritan River Bridge; New York & Long Branch Railroad.

When the new bridge over the Raritan river between Perth Amboy, N. J., and South Amboy was put in operation on April 21, the New York & Long Branch Railroad was relieved of an obstruction which has been the source of troublesome delays in operation, especially during the months when seashore travel has been at the highest. The road is operated jointly by the Central Railroad of New Jersey and the Pennsylvania, and is on the direct line between New York and the numerous seaside resorts of the eastern coast of New Jersey—Long Branch, Asbury Park, Atlantic City and

river bed borings were taken to a depth of 145 ft. as a maximum. The soil was found to consist of mud, clay and sand and gravel in order. Under such conditions piling formed a considerable proportion of the substructure work and some delays were experienced by the contractors, McMullen & McDermott, New York, owing to the difficulty of securing piling of suitable length. As shown by the elevation the bridge consists of 17 spans of 88 ft. each, 11 spans each 100 ft., and a draw span of 331 ft. The magnitude of the pile-driving operations is best indicated by the accompanying table showing the number of piles, the length of piling used and the depth to which they were driven. Piers Nos. 1 and 31 are the north and



Raritan River Bridge; Location Plan.

others. Heretofore, the Raritan river was crossed by a bridge near to the site selected for the one now in operation, but its capacity had been seriously hampered by the fact that although the line is double-track the draw was of the gauntlet type. Occupancy by two roads has made this feature even more objectionable than it would have been under other circumstances. In addition to the improvement which was effected by the reconstruction, advantage has been taken of the opportunity to adjust the alignment at the south end of the bridge so as to ease the curvature.

The relations of the old and new alignment are shown upon the accompanying location plan. The lines of the New York & Long Branch and of the Pennsylvania Railroad diverge at South Amboy, just beyond the south approach to the bridge, the latter line leading to Camden and the former to the seaside resorts. As formerly built, there was a 7-deg. curve on the New York & Long Branch just at the approach to the bridge. By a change of alignment such that the south end of the bridge lies some 200 ft. west of the location of the old bridge it has been possible to reduce this curvature to 3 deg. without changing the curvature of the connection with the Pennsylvania line to Camden. This remains at 6 deg. 30 min. The new alignment strikes the former line at Perth Amboy, the new bridge thus standing at an acute angle to the position of the old.

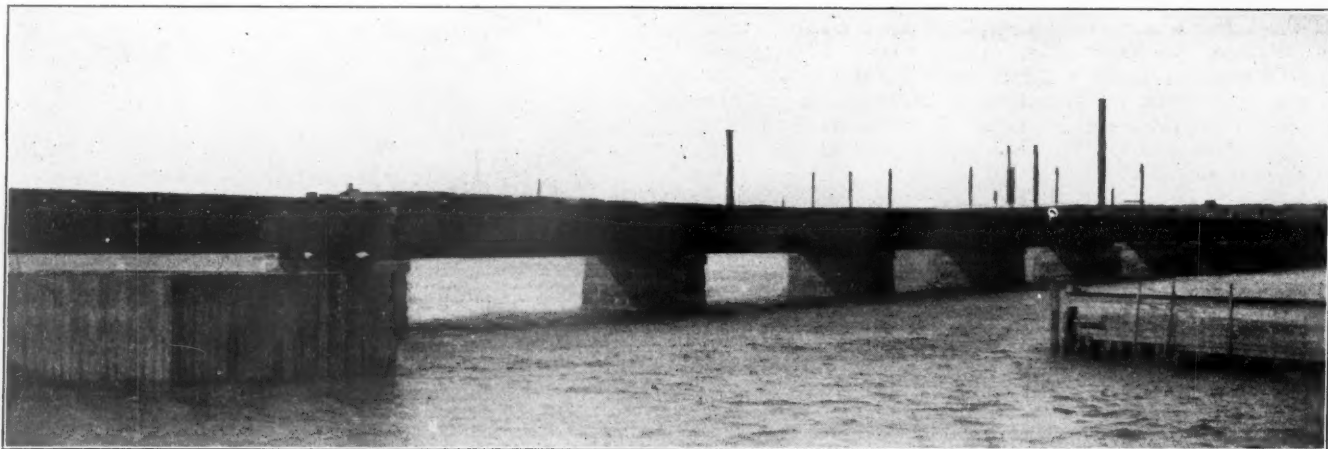
In connection with the change of alignment at the south approach, other changes have been planned, but will not at present be carried out. In general, these involve the removal of the South Amboy station, or rather the construction of a new union station, in the angle of the Y formed by the divergence of the two routes, and the widening of the overhead roadway crossing to permit the

south abutments respectively, and pier 20 is the pivot pier of the draw span.

Raritan River Bridge—Statement of Piling.

Pier No.	Number piles driven.	Length of piles, ft.	Depth driven, ft.
1.....	291	55 to 59	—25 to —30
" 2.....	102	55	— 55
" 3.....	102	65	— 65
" 4.....	102	80 to 90	—78 to —90
" 5.....	102	80 " 84	— 81
" 6.....	102	80 " 84	—80 to —84
" 7.....	102	84 " 92	— 95
" 8.....	102	84 " 92	—102
" 9.....	102	85 " 89	—100
" 10.....	102	85 " 89	—100
" 11.....	102	85 " 89	—100
" 12.....	102	85 " 89	—103
" 13.....	117	85 " 89	—102
" 14.....	121	85 " 89	—102
" 15.....	128	85 " 89	—109
" 16.....	130	80 " 87	—108
" 17.....	140	80 " 89	—110
" 18.....	167	80 " 85	—115
" 19.....	259	85 " 89	—122
" 20.....	576	85 " 94	—132
" 21.....	260	85 " 89	—124
" 22.....	190	85 " 89	—125
" 23.....	167	85 " 90	—118
" 24.....	128	85 " 89	—112
" 25.....	120	80 " 84	—100
" 26.....	116	75 " 80	— 94
" 27.....	102	70 " 74	— 85
" 28.....	102	60 " 74	— 64
" 29.....	102	60 " 64	— 70
" 30.....	102	55 " 59	— 60
" 31.....	291	55 " 59	— 30

The piers and abutments are of stone masonry with concrete backing. The center pier, rest piers and four piers on each side from the draw are of granite; the others are sandstone. Before piles

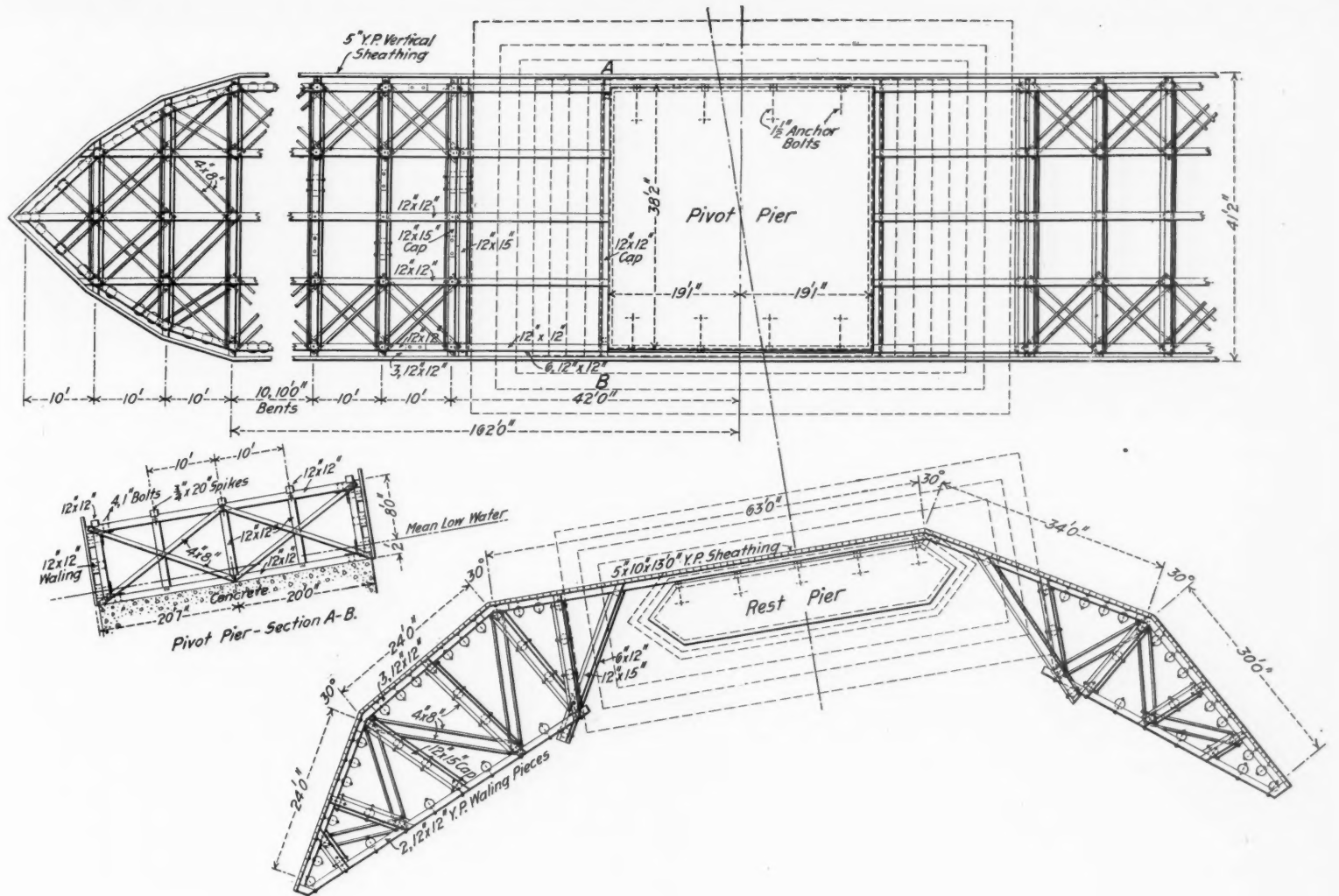


Raritan River Bridge; New Deck Girders.

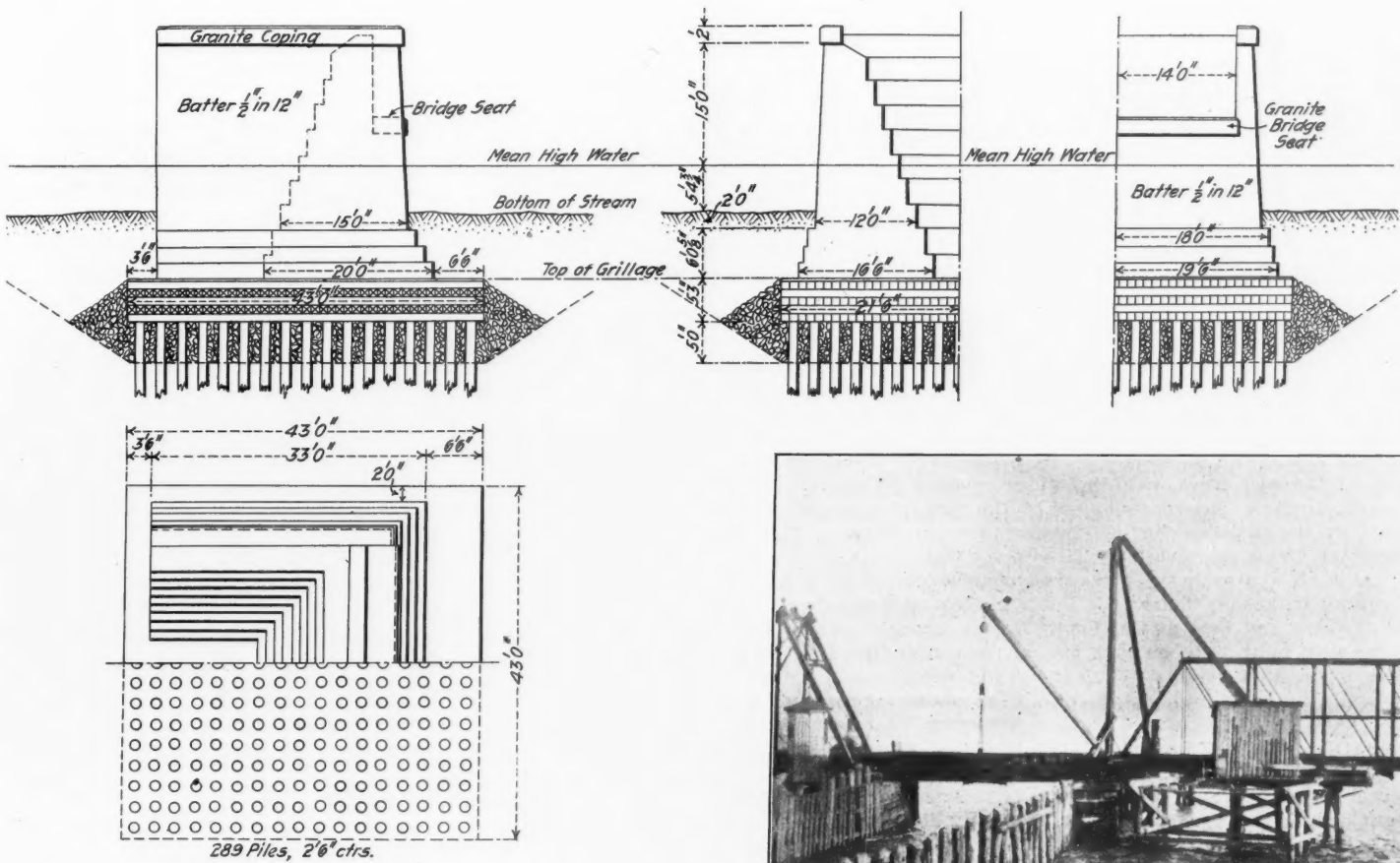
construction of a road to the depot parallel to and west of the New York & Long Branch tracks. At present, such trains of the Pennsylvania Railroad as are scheduled to stop at South Amboy are forced to proceed around the curve and then back up to the station. The improvement will involve the expenditure of about \$100,000 and will probably be undertaken in the near future.

Actual work upon the new bridge was begun two years ago—in February, 1906—though some preliminary work in the way of borings had been attempted before. Owing to the nature of the

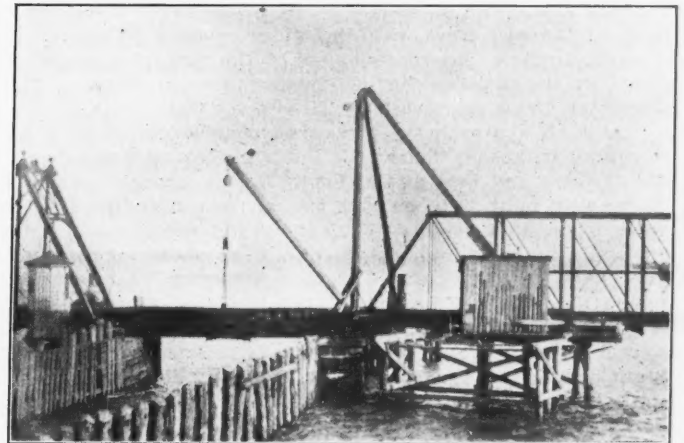
were driven the river bed at the side of each pier was excavated, and the piles after driving were cut off from 5 ft. above the bottom of the dredged area. The space between the heads of the piles was filled in with broken stone and concrete. A grillage of five courses of 12 by 12 timbers was built upon the heads of the piles, 18 by 41 ft. in the case of piers Nos. 2 to 12 and Nos. 27 to 30, and increasing up to 26 by 58 ft. under piers 22 and 29 by 68 ft. under the rest piers Nos. 19 and 21. Under the pivot pier the grillage is 57 by 78 ft., and in this as under the rest piers six courses of



Raritan River Bridge; Pivot Pier and Rest Pier.



Sections and Plan of Abutments.



Improved Draw Span During Construction.

12 by 12-in. timber are used. The grillage and the outer rows of piles are protected on all sides by rip-rap extending to the level of the bottom of the foundation course of masonry.

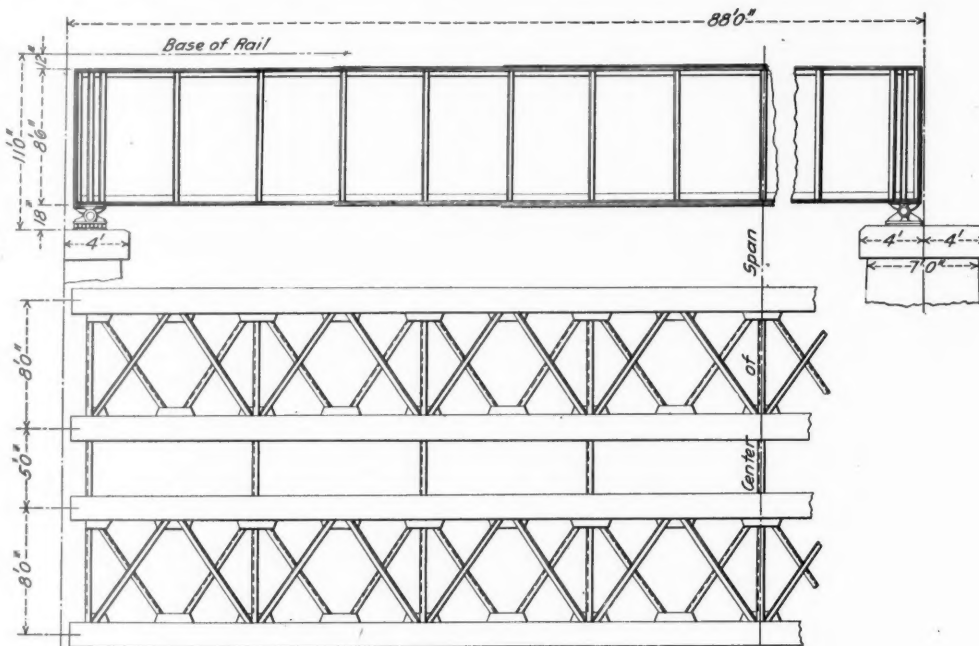
Upon this grillage the foundation courses are carried up to within 2 ft. of mean low water line where neat work commences. The latter is continued on a batter of $\frac{1}{2}$ in. per foot and finished with a granite coping 2 ft. in thickness and with its bearing surface 6 ft. above the line of mean high water. The difference between mean high and mean low water is 5.4 ft.

For nearly the whole of the pile-driving a 70-ft. steam pile-driver was used, and it was found that the same number of piles could be driven in about one-third the time required by the use of the drop-hammer. The driver was one that was built by the contractors with such extensions as were necessary to adapt it to the driving piles of unusual length. The total number of piles driven was 7,600, ranging in length from 55 to 94 ft. Some of the other quantities involved in the work were: Dredging, 72,670 cu. yds.; rip-rap, 16,000 cu. yds.; lumber in grillage, 2,300,000 ft. board measure; concrete below neat line, 11,276 cu. yds.; masonry above neat line, 4,274 cu. yds.; granite coping, 660 cu. yds. The proportions in which the concrete was mixed were 1-2-5.

The entire length of the structure is: From face of south bridge seat to center line of rest pier, 936 ft.; from face of north bridge seat to center line of rest pier, 1,652 ft.; draw span, center to center of rest piers, 331 ft.; total, 2,919 ft. The length of the old draw was 472 ft.

The fenders for pivot and rest piers are built of 12 by 12-in. timbers supported on piling. That of the pivot pier is built in 10-ft. bents with 4 by 8-in. diagonal bracing between piles, 6 by 12-in. clamps and 4 by 8-in. bracing, all of yellow pine, and bolted with 1-in. and $1\frac{1}{4}$ -in. bolts. The sheathing is 5-in. yellow pine placed vertically and carried by three 12 by 12-in. stringers. The bents next the pier itself, on each side, where pile support is impracticable on account of the pier foundation, have six 12 by 12-in. stringers in place of three.

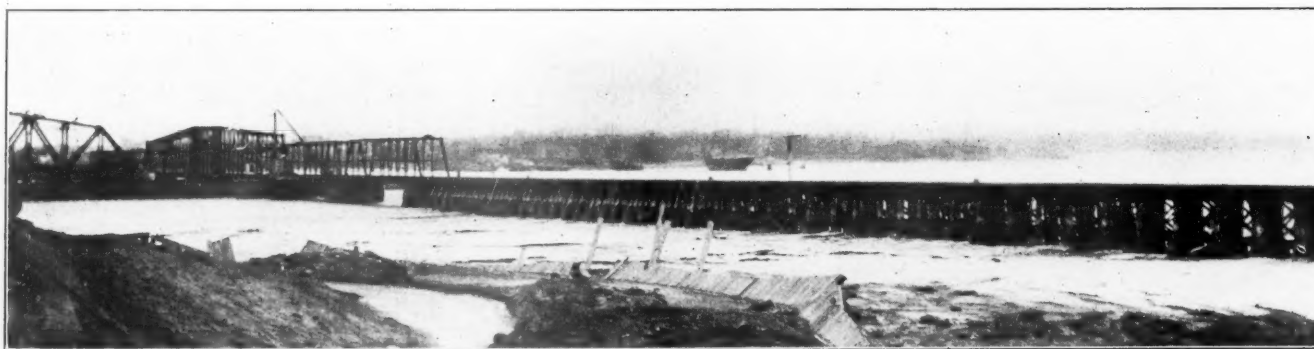
to their former position. The extent of the pressure exerted is shown by the bulging of the surface of the ground as far over as the embankment of the old line, some 200 ft., and by the fact that in some cases the ends of the brace piles were forced through the 5-in. sheathing though supported by the stringers on 5-ft. centers. The position of the abutment, however, was not disturbed.



Elevation and Floor System of Girder Spans.

SUPERSTRUCTURE.

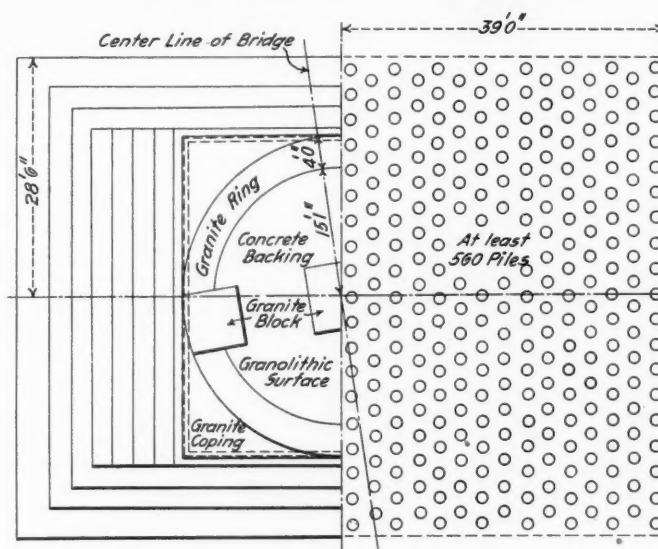
The superstructure, which was erected by the Pennsylvania Steel Company, presents no features of special interest beyond a general appearance of substantiality. With the exception of the draw, all spans are plate deck girders, 8 ft. 6 in. deep; four spans at the south end and 11 at the north end being 88 ft. long, the abutment spans 84 ft., the intervening spans 100 ft., and the draw span, as stated, 331 ft. The plate girders amount to about 4,000 tons of steel and the draw span to about 1,200 tons.



Raritan River Bridge; "Squashed-Out" Bulkhead and Old Trestle.

The fender for the rest piers is carried at an angle of 30 deg. to the face of the pier for a distance of 24 ft., and then at an angle of 60 deg. for a distance of 30 ft. on the side against the current of water traffic, and at the same angles for 24 and 30 ft. on the opposite side. The pivot pier is set at an angle of 10 deg. to the faces of the rest piers with the wider opening facing the current of river traffic. The construction of the rest pier fender is substantially the same as that of the pivot pier protection. The clear channel is 130 ft. on each side of the pivot pier.

At each approach the embankment is protected by a pile and sheathing bulkhead, that at the Perth Amboy approach being about 380 ft. long and that at the South Amboy approach about 275 ft. These were built 50 ft. on each side of the center line and the piles were driven to a depth of 45 to 50 ft. and spaced about 5 ft. apart with pile brace at each driven pile. The sheathing is 5-in. yellow pine plank carried by two 6 by 12-in. stringers. A remarkable demonstration of the character of the soil was given in the course of constructing the embankment within the south bulkhead. The weight of the fill carried the bulkheads in each direction to a maximum distance of perhaps 40 ft. The movement took place bodily until the position of the brace piles was brought so nearly to the vertical that they no longer afforded support, and the structure now rests with the brace piles in a substantially vertical position and the formerly vertical piles leaning at an angle of about 45 deg.



Raritan River Bridge; Foundation of Draw Span Pivot.

Though in no way connected with the new construction, an interesting expedient has been developed in connection therewith. On September 11, 1907, the center casting of the old draw span broke, making it impossible to operate the draw. In view of the prospect of speedy replacement with a new structure no attempts were made at repairs. Instead, the span next south of the draw was made removable and a derrick rigged on pile foundation just to one side of the adjacent span by means of which the span could be lifted from its seat and swung around away from the channel. A double row of piles was driven to serve as guides to the new channel, and in 18 days—during which, as may be supposed, the river on both sides became badly congested with craft of all kinds—the extemporized draw was in operation and afterwards worked as satisfactorily and expeditiously as the old draw. On the first day of its operation 115 boats passed through. Seventeen to 21 times per day is the maximum number of draw openings required in the busy season. The lift span weighs 20 tons, and it requires 1½ minutes to operate it with the derrick to give a clear passage way.

The cost of the entire structure as above described was about \$1,000,000. All the steel work has been painted with Dixon's graphite. The contractors for the substructure and superstructure are named above. The work was done under the general super-

vantage when trains break in two. One management which has used the horns for repeating starting signals, reports that they can be heard for great distances, even against the wind.

Existing and Projected Railroads in China.

According to a consular report from Thornwell Haynes, of Nankin, the mileage of roads in the Chinese Empire now in operation, being built and projected, including the railroads built under the Manchurian concession, is about 9,000 miles. This is more than Spain's, only a thousand miles less than Italy's, and nearly half as much as in the United Kingdom. As compared with the United States, however, it is less than that of the single state of Illinois, or of Ohio, or Pennsylvania, or Texas. The railroads are grouped below according to the nationality of their concessionaires.

CHINESE CONCESSIONS.

Peking-Siling.—This line, extending from the capital westward to Siling, is nearly 40 miles long. It was built by native engineers some years ago and has since been in continual operation.

Shanghai-Woosung.—This 12-mile line was first built in 1876 by an English firm. For a year it carried considerable traffic, but then the Chinese Government, objecting to its being in the hands of foreigners, bought it, tore it up and transferred the rails and rolling stock to Formosa. In 1898 the Chinese Government rebuilt it and it is now paying well. It is to be made a part of the Shanghai-Soochow system.

Wuhu-Sengan.—Surveys were recently begun on this line, beginning at Wuhu and running 30 miles to the southeast. At present the work seems to be at a standstill through lack of money. It is projected to Hangchow, in Chekiang, 150 miles, to connect with the projected railroad system of that province.

Pinghsiang Chuchow.—This line, which at first connected the coal mines of Anyuen with Liling, 23 miles, has been extended west to Chuchow, on the proposed Hankow-Canton, and east to Pinghsiang, 66 miles in all.

Nanchang-Kiukiang.—A concession for this line, 76 miles long, was granted to a Chinese syndicate some years ago. Recently the gentry of Kiangsi decided to begin building.

Chengtu-Hankow.—The building of this road was authorized some years ago. It is said that the gentry and officials of Szechuen have decided to start the construction of the 60 miles between Chengtu and Chiangkou and thus begin the building of the proposed road to Hankow, which will be the great trunk line crossing the Empire from west to east, as the Peking-Canton line is to be from north to south. When completed the road will be some 800 miles long.

Changsha-Chenchow.—During the early part of 1906 a Chinese syndicate was formed and got permission to build a road between Changsha and Chenchow via Changseh, about 200 miles. These cities are large and important commercially, all being in Hunan province, which is rich in coal.

Canton-Whampao.—A concession was given in 1906 to this line. It is only 10 miles long, but it is important not only because it would form part of a line passing through Swatow to Amoy to connect with the system of Fukien province, but that Whampao, with its deep and magnificent harbor, might seriously affect the commercial interests of Hongkong.

Amoy-Changchow.—This line, which will be about 30 miles long, is being built under the direction of the famous Lin family, formerly the millionaires of Formosa. It may, later, be extended to Foochow.

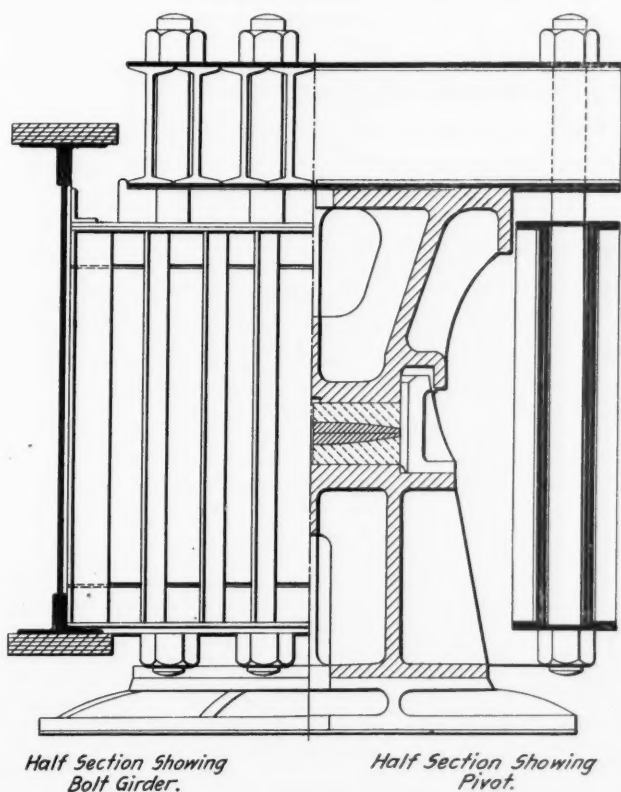
Swatow-Chaochowfu.—This line, which is 30 miles long, connects the port of Swatow with Chaochowfu, the capital of the prefecture of that name. It was built by Japanese contractors, and all the material except rails and locomotives was imported from Japan. It was finished in 1906.

Canton-Hankow.—This line was planned as a 750-mile extension to the coast of the existing line from Peking to Hankow. For financing the Canton-Hankow line, the American China Development Company agreed in 1898 to spend \$20,000,000. The concessions were sold back to the Chinese Government in 1906 for \$6,750,000. Work on the main line has been carried about 70 miles above Canton, where it remains awaiting the settlement of a seemingly interminable struggle for dictatorship between the Viceroy at Canton, the gentry and the merchants.

Peking-Kalgan.—This line, connecting the capital with Changchiakou or Kalgan, 125 miles, is being built with Chinese Government capital and by Chinese engineers at an estimated cost of \$4,500,000. It has been decided by the government, at the recommendation of Viceroy Yuan Shih-kai, to extend the line, when finished, from Kalgan to Uрга, the capital of Mongolia, and thence to Kulun, on the Mongolian frontier; the funds for this extension have already been provided.

Chinanfu-Chenting.—The concession for building this line was originally granted to Germany, but, being redeemed, preparations for its construction and rolling stock are progressing.

Hangchow-Soochow.—The gentry and people of Chekiang Prov-



Raritan River Bridge; Details of Draw Span Pivot.

vision of Rufus Blodgett, General Superintendent, New York & Long Branch Railroad. James F. Cullen, Assistant Engineer, Pennsylvania Railroad, and H. R. Leonard, Engineer of Bridges and Buildings, Pennsylvania Railroad, were in actual charge of construction.

Foreign Railroad Notes.

Karl Stieler succeeds von Balz at the head of the Württemberg State Railroads. Stieler, like his predecessor, had a juristic training, and has been in the railroad service only since 1900. The Württemberg railroad administration is a bureau of the Ministry of Foreign Affairs.

A telegram from London prognosticates the completion of the "Cape-to-Cairo" Railroad in about six years, when the railroad in Portuguese West Africa from Lobito Bay to Katanga is opened. As this latter line is to extend nearly due east from the Atlantic in about 12 deg. south latitude, it is hard to see how it will bring the Cape railroads any nearer Cairo, an outlet which they need about as much as the Texas railroads need a connection with Hudson's Bay.

The Prussian State Railroads are experimenting with signal horns, with which conductors and brakemen are to repeat brake signals given by the enginemen, which on long freight trains sometimes are not heard by all the brakemen, especially in stormy weather when they have their collars turned up. It is also proposed to ascertain whether these horns may not be used to ad-

ince have formed a company to build their own railroads. They have appointed a Chinese engineer as chief engineer and are busily engaged in collecting capital. The first line to be built will run from Kungshun Bridge, near the settlement of Hangchow, to Kiangkan, on the Chentang River, 15 miles, whence it will be pushed on to Kashing and Soochow. A wise arrangement has been made among the gentry of the five provinces, Kiangsu, Kiangsi, Anhui, Chekiang and Fukien, by which the roads in their respective provinces when completed will have a uniform gage so as to form an intercommunicating system in east central China.

Kaifeng-Chengchow.—This is a branch line of the Ching-han Railway, and connects Kaifeng and Chengchow. It is 50 miles long, and grading is completed.

Taiyuan-Pingyao.—This line is in Shansi Province, and the officials and gentry there have decided that the first road built by them shall connect Taiyuan and Pingyao, in the Fen Chou prefecture, 100 miles. They have also decided to build the following lines, for which they have the necessary authority: (1) From Tatungfu to Kalgan; (2) from Puchou to Tungkuang, in Shensi, crossing the Yellow River; and (3) from Pingyan to Tsechou, connecting with the Taokou & Tsechou Railway, which was built by the Peking Syndicate and afterward sold to the Chinese Government.

BRITISH CONCESSIONS.

By certain concessions in Shansi and Honan Provinces the Peking Syndicate (Anglo-Italian) secured rights to build a road from Taiyuan, in Shansi, to Singan, the capital of Shensi, whence a line is planned parallel to the Yellow river to connect with Kaifang, the terminus of a branch of the Peking-Hankow Railway. The same syndicate is also to build a line from Tsechou, on the southern boundary of its mine fields, to Singan, 250 miles, on the Han river. To connect the coal fields of northern Honan, work was begun on a line from Chinghua to Taokou, whence the Grand Canal could be reached by the Wei river, thus having water connection with Tientsin. The line has already been completed and ballasted for 90 miles from Taokou.

Peking-Newchwang.—This line, 555 miles long, is in operation. It was built with British capital, but sold two years ago to the Chinese Government. It runs from Peking to Tientsin, to which point it has a double track, thence through Tongku, Shanhaikwan and Kinchow to Newchwang.

Tientsin-Chinkiang.—The concession for this line is owned by the Anglo-German syndicate. The southern half has been apportioned to the British & Chinese Corporation and the northern half to a German company.

Soochow-Hangchow.—This line, 200 miles long, and the Kowloon-Canton line, which is under construction and 100 miles long, are concessions of the British & Chinese Corporation.

Shanghai-Nanking.—The concession for this line was secured by the British & Chinese Corporation. The Shanghai-Woosung line is included. The length of the road is 200 miles, passing through the cities of Soochow, Wusieh and Chinkiang. The line is in operation for about 150 miles from Shanghai. It is expected that the rest will be opened in the summer of 1908.

GERMAN CONCESSIONS.

Kiaochow-Chinanfu.—In 1889 certain German syndicates and the German Government obtained from the Chinese Government railroad and mining concessions in the province of Shangtung. By the treaty of March 6, 1898, the construction and maintenance of these roads were to be carried on by a German-Chinese company, formed as a joint stock company with the title of "Shangtung Eisenbahn Gesellschaft." This company was formed in Berlin in June, 1898, with a capital of \$12,852,000, and shortly afterwards headquarters were transferred to Tsingtau. It was soon decided not to build the line from Chinanfu to Ichoufu, or any other point on the southern boundary of Shangtung Province. The Tsingtau-Chinanfu line was built during the winter of 1903, and has been in continuous operation ever since. It had its own postal and telegraph services until recently, when, owing to the strong representations of the Chinese Government, the separate postal service was given over to the Imperial Chinese postal service.

Tientsin-Chinkiang.—In May, 1898, a concession was granted to the Deutsch-Asiatische Bank and the British & Chinese Corporation, represented by the Hongkong & Shanghai Banking Corporation. The northern half of the line is to be under the control of the German bank, and the southern half is to be under the control of the Hongkong & Shanghai Bank, and is to run from Tientsin to Chinkiang on the Yangtse. The line will be in all about 600 miles long.

Chinan-Chingting.—A concession was granted to the Germans to build this line to connect with the Peking-Hankow Railway, but the concession was recently, when the German railroad garrisons were withdrawn, resold to China for the price originally paid.

FRENCH CONCESSIONS.

Tongking-Yunnan.—This line is intended to connect Hanoi, in

Tongking, with Mengtze and Yunnanfu, through the Lan river valley, about 200 miles. This line is in operation as far as Mengtze, and grading has been finished as far as Yunnan.

Langson-Lunghow-Nanning.—The concession for this line, which is about 100 miles long, was secured in 1889. No work has been done on it.

Pakhoi-Nanning.—Nothing has been done on this line. The two cities are about 120 miles apart.

BELGIAN CONCESSIONS.

Ching-han or Peking-Hankow.—This line, which is about 800 miles long, was authorized in 1889. The part of the line between Lu-kao-chiao and Paotingfu, some 90 miles, was built with Chinese Government capital under the direction of British engineers. The concessionaire of the portion from Paotingfu to Hankow was the Franco-Belgian Syndicate. At present one train leaves Peking and one leaves Hankow daily and already attract many passengers and much freight.

PORTUGUESE CONCESSIONS.

Macao-Samshui.—This line from Macao is to run to Siang-shau, thence to Kong-Moon and to Samshui, the terminus, where it connects with the Canton-Samshui branch of the Canton-Hankow Railway. Unlike nearly all the other railroads in China, this one will be an entirely commercial undertaking, free from all governmental interference or political control. As it will pass over the Canton and West river delta, many bridges will be necessary, making the work costly. The distance is about 130 miles.

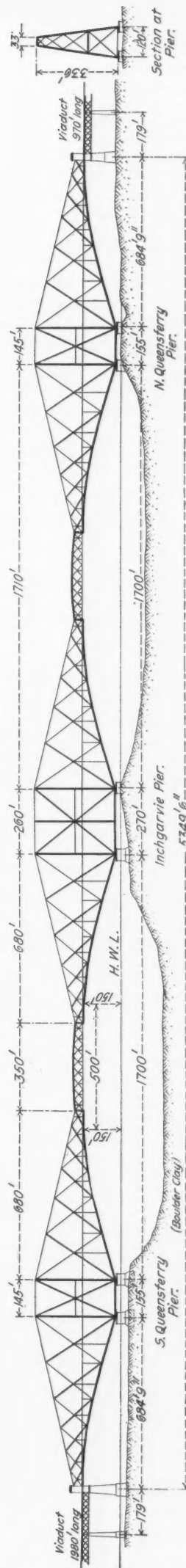
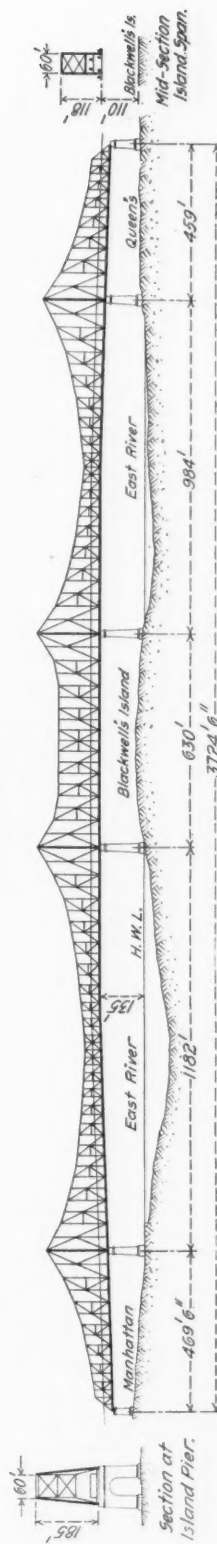
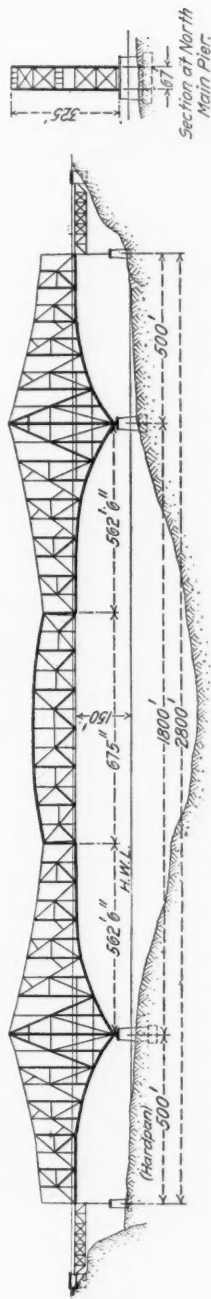
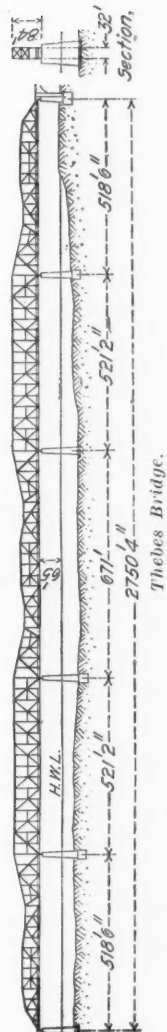
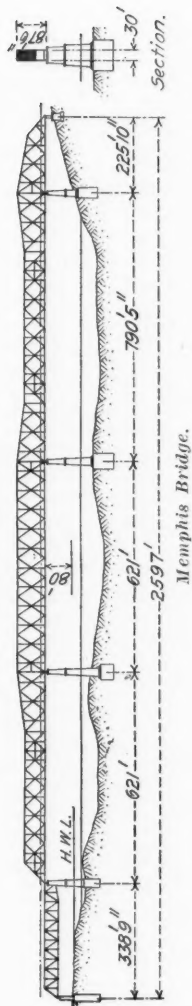
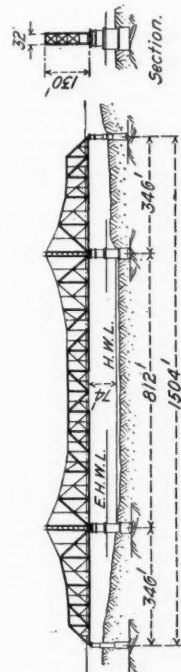
CHINESE IMPERIAL RAILWAYS.

Peking-Tientsin-Shanhaikwan-Newchwang.—For this road a loan of \$11,155,000, bearing 5 per cent. interest, was made by the British & Chinese Corporation, whose agents are the Hongkong & Shanghai Banking Corporation. The lines mortgaged as security for this loan, and which are in operation, are the 84 miles Peking to Tientsin, double track; 27 miles of single track Tientsin to Tongku, and 147 miles Tongku to Shanhaikwan, single track. This loan also has a first lien on the earnings of the 130 miles, Shanhaikwan to Kinchow, single track, and 130 miles Kinchow to Newchwang. These lines constitute a continuous 526 miles of road, exclusive of 30 miles of sidings, all of standard English gage. It has been computed by the engineer in chief of the imperial railroads in North China that the capital cost of the intra-mural line from Peking to Shanhaikwan, 258 miles, exclusive of sidings, was \$9,529,000, or about \$36,650 per mile. The cost of the line from Shanhaikwan to Chungchowsu (40 miles) was about \$40,315 per mile.

For the line from Peking to Chungchowsu, a point 40 miles outside the Great Wall, according to the same authority mentioned above, the gross earnings before the year 1900 averaged \$1,466,000, while the net income was \$586,400, or 5 per cent. on the \$11,728,000 capital. But railroad enterprise was then only in its infancy and the volume of both passenger and freight traffic must have greatly increased since, so that under proper management there is no reason why a profit of 8 or even 10 per cent. should not be returned. During 1905 it is computed that the net income was enough to pay a dividend of 20 per cent. on the capital cost. The bridges of these lines consist of steel girders resting on masonry or concrete piers and abutments, sunk by compressed air to a proper foundation. The largest and longest bridge on the intra-mural line is that over the Lan Ho, spanning a distance of 2,200 ft.

At Tongshan are the principal workshops, where several thousand men are employed in car building and general repair work. Here and in the vicinity are also the Chinese Engineering & Mining Company's mines, the products from which yield much traffic. The mines are now working as a joint stock company composed of foreign and Chinese stockholders and registered in London. They employ about 10,000 men, with an output of about 3,000 tons of coal per day. The shops for girder building are at Shanhaikwan, and can turn out 6,000 tons of girders per year.

The rolling stock is built similar to American types. The freight cars have 30 tons carrying capacity. The passenger cars are similar to those in America, having through passages and end platforms. At Kaochiao, which means "High Bridge" and is 60 miles from Shanhaikwan, there is a branch line running north-westerly for 30 miles, and connecting with the Nanpiao coal mines. These mines are pronounced by experts to be the richest and most valuable coal mines in North China. There are two large bridges on the Shanhaikwan-Newchwang lines—one across the Talingho, east of Kinchow, and the other over the Siaolingho, immediately south of the same city. The latter bridge, which was of much more difficult construction than the other, was built by a Chinese civil engineer who graduated from the Sheffield Scientific School of Yale University. At Yingkow, the sea port of Newchwang, is the more important terminus of the extra-mural line; 1,000 acres have been bought to take care of the traffic. The author states that in the preparation of this report he was greatly assisted by the *Chinese Daily Nanfangpao*.



Elevations and Spans of Six Great Cantilever Bridges.

Picked Up on the Road.

BY GULF.

The use of snow fences by American railroads in the northern climates has come *de novo* during the past 15 years. It was along in 1893 or 1894 that an article appeared in the *Revue Generale des Chemins de fer*, giving, in the usual French completeness of detail, the designs of snow fences on the several European roads and the results obtained from their use. At that time a snow fence was almost entirely unknown in the United States, while abroad they were common, especially in the Alpine country, though there was very far from being a uniformity of design. Soon afterward, in consequence of attention having been called to the matter or because of spontaneous processes of thought, the snow fence appeared in this country. Its form was tentative at first, and in some cases recourse was had to throwing up a bank of snow to serve as a deflector—a device said to have been efficient, but not sufficient. Soon, however, the present form was evolved, which now may be called standard. It consists of an open fence with horizontal bars of boards about 6 in. wide leaning towards the track at an angle of about 45 deg. with a slope back at the top at right angles to the lower part for a foot or 18 in. These fences are portable and it is interesting to note their location with reference to the track at different points, showing the effect of natural topography on the deflection of wind current and the drifting tendency of the snow. This drifting can be turned to good account, and it is strange, with all the troubles roads in the North had with snow shifts before the advent of the rotary plow, including expensive hand shoveling, where the snow was thrown from one level to another until it reached the top of the bank, that no one ever noticed the tendency of snow to gather on the lee side of a fence, and utilized it to protect a suffering railroad beyond. But we didn't, and we had to wait for some scientific chap on the other side of the water to teach us the trick. However, we have evidently learned it now, and are profiting accordingly.

If there is any one thing more than another that adds to the comfort of the traveler by night, it is the berth light used in the sleeping cars of most western roads. It changes discomfort into luxury and is probably the most highly appreciated improvement that has been made for many a day. It does not take a very old man to recollect when there were no lights in the staterooms of our river boats, but that is a thing of the past, and it is to be hoped that the dark berth of a sleeping car will soon be in the same category. It seems strange that, though these lights have been used for years in the West, they are still a scarcity on eastern roads.

To paraphrase the enthusiasm of a western railroader, we (westerners) are the people. Whenever anything is brought out that makes for comfort or luxury, or, I may add, that has an advertising value, we take it up and put it through. So we have electrically lighted trains and trains brilliant with acetylene and Pintsch gas, and we use the latest wrinkles in them all. We have tourist sleeping cars to accommodate those who want them; and that weary, forlorn crowd that fills the ordinary coach on the night runs of eastern lines is almost unknown. We also have the chair car that gives almost all the comfort of a Pullman parlor and costs nothing extra.

Why is it that the average newspaper manager thinks that anyone can correctly report scientific matters, and, above all, matters pertaining to railroad mechanics, especially the mechanics of an accident, when they consider it necessary to have an especially trained expert to report on musical or dramatic performances? Are the intricacies of the locomotive or the track so very much simpler than the intricacies of the sonata or the fugue that anyone can understand, or, not understanding, can convey an understandable idea to the average reader? But really, isn't it quite as important, in its way, not to say that the main crank pin of the forward truck was broken off just inside the rear driving axle of a consolidation locomotive as it is to be able to point out the recurrence of the theme of the apprentice song in the *Meistersinger*? So, when some event of importance in railroad affairs is to be chronicled, why does not the Associated Press or the daily paper send a man who knows how to do the work? During a recent inquiry, the New York and Philadelphia papers gave from a half column to a column and a half every day to the matter, and discussed it very thoroughly and apparently to their own satisfaction, and yet not one of them came within gunshot of stating the case, but each went off and discussed a matter entirely foreign to that in hand, simply because the first reporter in the field jumped to a conclusion, and, as usual, jumped wrong.

I was the amused and highly instructed recipient of a Pullman porter's confidence the other day. "I ain't got no use fo de women," he said. "Dey needs no waitin on dan a sick kitten. Dey wants dis and dey wants dat, and den dey wants de oder ting, and when

you get true wid 'em, dey just says 'Tank yo.' Now, you know dat a man can't live on 'Tank yo,' and dat he wud starve to death on wot he gits fum de company. Now, wid de men its diffunt; yo see a man puts his shoes down on de flo, and yo gits at 'em befo' he's up in de mawnin and blacks 'em up kinder nice, and dey ain one man in a hundred mean enuf not ter give yer suthin, whether he wants his shoes blacked or not. In a parlor car its diffunt too. What yo can make out o' a car depens morely on who sits in de front seat. If you comes along wid yo brush and he shakes his head, its mos' likely haf de men in de car will shake der heads too, and you won't git nuffin til yo comes to a man wif a lady. Den you kin git started and make suthin out o' de res' o' de car." All of which goes to show that there is a mutual understanding between the porter and the passenger that the tip is decidedly the result of a virtual hold-up, and that most men are too great moral cowards to resist, unless there is some courageous soul in the front end of a parlor car whom his fellow travelers follow with all the boldness of a flock of sheep.

Traffic Arrangements in Japan.

The annual report of the Imperial Government Railways of Japan for the year ended March 31, 1906, recently published, contains the following remarks:

"Among the principal traffic arrangements adopted during the year may be mentioned as follows:

"From April 1, 1905, alterations were effected as to the period of availability of tickets and at the same time rules relating to extra fare and overcharge were enacted and put into force. The available limit in the old system was graded at three days for distance of not less than 100 miles and under 200 miles, four days for distance of not less than 200 miles and under 300 miles, and five days for distance of over 300 miles. In the new arrangement one day is to be added for each additional 100 miles or fraction thereof, for distance of not less than 100 miles. The extra fare is to be exacted within the limit of three yen* for the first class, two yen for the second and one yen for the third in the following cases: when a traveler gets in a train without a ticket (this applies also to cases when a passenger has traveled without permission of the proper officials beyond the destination mentioned on the ticket), or has boarded a train with an invalidated ticket, or refuses to produce the ticket for examination or to deliver it for collection, the additional fare equal in amount to the regular fare will be exacted. When a traveler has removed to a superior class car without giving notice to the officials, besides exacting the balance the sum equal to it will be additionally charged. The additional payment is to be charged when a traveler who has no time to buy the ticket is allowed to get in the train by the proper officials, this payment being 20 sen† in addition to the regular fare. When the regular fare is less than 20 sen this payment shall not be more than the fare.

* * *

"In April, 1905, a new arrangement was adopted for the handling of parcels of the same kind when they start at the same station and are destined to the same address and station, in case the parcels are more than two in number and come from one and the same consigner. The freight on such parcels is to be determined with the consent of the consigner on the average weight of one parcel. The new system was applied only to the three kinds of fresh fish, vegetables and fruit.

"In regard to the handling of wagon goods, it may be mentioned that from May 1, 1905, the grade of tea that was formerly included in the list of valuables was lowered to the third class. On October 1, rules relating to the rebate of freight for wagon goods were revised in regard to section pertaining to the Shin-Yetsu, Shinonoi and O-U lines. According to the former arrangement the rate was 3 per cent. for the sum that amounted to not less than 5,000 yen and under 8,000 yen a month, 4 per cent. for the sum of over 8,000 yen and under 10,000 yen a month, and 5 per cent. for the sum above 10,000 yen. In the new arrangement the rate was graded as follows: 2 per cent. for a sum over 10,000 yen and under 15,000 yen a month; 3 per cent. for a sum above 15,000 yen and under 20,000; 4 per cent. for a sum above 20,000 yen and under 25,000; 5 per cent. for a sum above 25,000 yen.

"From January 1, 1906, the scope of express delivery service of goods that was formerly confined within the limit of the seat of a station was extended and was made deliverable within the limit of a city where the station is situated or within the radius of 1½ miles from the station."

The railroads included in the German Railroad Union had 62,813 miles of road at the beginning of this year, of which 34,159 miles were in Germany, 24,338 in Austria-Hungary, 1,938 in Holland, 1,913 in Rumania, 306 in Russian Poland, and the remainder in Luxemburg and a Balkan state.

*A yen is about 50 cents in United States money.
†100 sen make a yen.

Single Phase Equipment for the Richmond & Chesapeake Bay.

The Richmond & Chesapeake Bay Railway was recently completed from Richmond, Va., to Ashland, 15 miles. It is planned to later extend it to serve the territory lying between Richmond and Washington. It is a single-track electric road with turn-outs, using single-phase current with a trolley potential of 6,600 volts.

There are no sub-stations for the operating current, but there is a lighting sub-station at the Ashland terminus. The road has at present no power station of its own, the generating apparatus being installed in the Twelfth street power house of the Virginia Passenger & Power Co. This consists of two General Electric 750-k.w., 25-cycle, three-phase generators running at 128.5 r.p.m. and designed to give 6,600 and 13,200 volts. One of these generators

core is used for the line feeder and the others are connected to the rails and serve as a return circuit. At the terminal depot the cable enters a high-tension cabinet before its connection to the trolley.

The electrical equipment of each of four motor-cars, which at present comprise the rolling stock, consist of four GEA-603-A railway motors, and a full complement of multiple unit, type M, Sprague-General Electric control apparatus. The motors are the series-repulsion type. The fractional pitch winding of the armatures performs the same function as do commutating poles in direct-current motors. Each motor has 125 h.p. capacity. The capacity and high starting torque of these motors were well illustrated on one of the trial trips, when one car was coupled up to a train of five Norfolk & Western standard passenger coaches carrying 300 passengers, and hauled the load with ease. To further test their capacity, two of the motors were cut out, and the remaining two started this same train on a 1 per cent. grade.

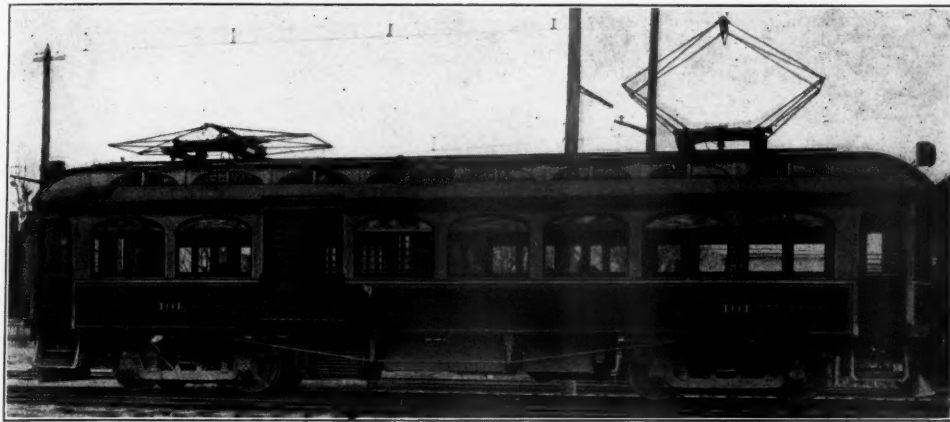
The control is in duplicate. Each pair of motors, with their compensator and contactors, forms a practically independent equipment. Should one motor or any part of half of the equipment become damaged, the car could be operated as a two-motor car by throwing one blade of a double-knife disconnecting switch. The actual control apparatus is nearly standard throughout. The master controller is type C-40-A and the contactors are the ordinary a.c. type.

These are the first General Electric equipments ever put in operation with two compensators. The compensators are oil cooled and are provided with taps to give 600, 450, 400, 340, 280 and 113 volts. The 600-volt taps are used only on the auxiliary circuits. All the high tension apparatus is enclosed in an asbestos-lined cabinet. Each car is equipped with two pantograph trolleys with steel pans, this material having been found to give greater satisfaction than either copper or aluminum.

The car bodies were built by the St. Louis Car Co. and closely resemble the standard Pullman car. Each has separate accommodations for white and colored people. The combination passenger and smoking car has a seating capacity of 64 persons, and the seating capacity of the combination passenger and baggage car, shown in the accompanying photograph, is slightly less.

The trucks are the inside suspension type and were built by the Baldwin Locomotive Co. The air-brakes have graduated release, which is found in the straight air type, and can also be operated as an automatic system.

The overhead construction is the catenary suspended type. The



Combination Car, Single-Phase; Richmond & Chesapeake Bay Railway.

is direct-connected to a 1,450-h.p. hydraulic turbine at one end of the shaft and to a 750-k.w., 60-cycle, 2,300-volt, three-phase generator at the other end, both units being mounted on the same base. Should there be insufficient water to operate the turbine, the 60-cycle generator will be run as a motor. The other 25-cycle machine is coupled to a water turbine, and also to a 750-k.w. direct-current generator, the latter machine being used as a motor in the event of low water. When water power is plentiful the 60-cycle generator and the direct-current generator can be used for city lighting.

Under present operating conditions, only one phase of the generators is used to supply the line voltage. The transmission cable is laid underground in a vitrified earthenware conduit to the Richmond terminal depot, 1½ miles distant. It is a three-core, lead-covered cable, each core having the capacity of No. 0 wire. One



Reinforced Concrete Viaduct; Richmond & Chesapeake Bay Railway.

trolley wire is No. 0000 grooved copper, and the messenger cable is steel and has seven strands. On the first section of the road, between the Richmond depot and the car barns, the track is laid on a reinforced concrete viaduct shown herewith, the trolley being supported by steel spans. Bracket supports are used on the other sections of the road.

The sub-station at the Ashland terminus, as already mentioned, provides for the lighting of the town. This is probably the first time that an attempt has been made to supply a lighting system from a high tension single-phase trolley subjected to severe load fluctuations. Tirrill regulating apparatus is used in both the sub-stations and main station. The 6,600-volt single-phase current is transformed to 440 volts by two 25-cycle oil-cooled transformers of 150 k.w. each. From the low tension side, the current passes through a reactance or phase splitting device to the induction motor end of a motor-generator set, consisting of a 150-h.p., 25-cycle, 440-volt, single-phase induction motor direct connected to a 100-k.w., 2,300-volt, 60-cycle, single-phase generator. A 4-k.w., 125-volt exciter is mounted on the common shaft at the generator end. The 2,300-volt, 60-cycle current leaves the sub-station through a two circuit single-phase feeder panel for general lighting purposes in the town of Ashland. All oil switches are designed for 6,600 volts and are enclosed in cells constructed of brick and fiber floors. All the machinery, switchboards, indicating and measuring instruments are of General Electric manufacture.

Car Surpluses and Shortages to April 15.

The Committee on Car Efficiency of the American Railway Association has issued Bulletin 21-A, giving a summary of surpluses and shortages of freight cars by groups from October 30 to April 15. The total surplus, which showed a slight increase in the last bulletin, now reaches 375,770, the highest figure yet recorded. The largest increase is in coal cars, 160,205. There is a further increase

the rest. The tramp as a factor in traffic appears to be relatively on the decline and absolutely on the increase. These conditions will doubtless continue for a very considerable period although it is conceivable that in a few decades the tramp may assume a stationary and possibly a declining total of service. This possibility of a static or declining position arises from the great growth of commerce in all parts of the world which is continually causing the establishing of lines in places where the tramp alone had previously sufficed. A good illustration of this is to be found in the port of Pensacola, Florida, from which for a number of years tramp vessels had sailed to Europe and occasionally to the Orient with cargoes of lumber and cotton. This service, which has been almost entirely devoted to carrying the freights of the Louisville & Nashville Railroad, has been so organized that the management now announce a line service to various European ports, although the infrequency of departures has caused some people to question whether it is really a line service. However, the departure of vessels under regular management from one port to another, year after year, can probably be classed as line rather than chartered traffic although the interval is somewhat uncertain. It therefore represents a transfer of one more piece of the world's ocean from tramp to line territory—a development which must inevitably go on as world commerce following the development of railroads embraces a great and greater part of the world's sea coast.

Third.—The private steamship line seems destined to have considerable absolute growth during the reasonably near future. It is part of the growth of the modern industrial corporation and there is no indication that we have reached the end of the development of larger scale operations. Indeed the magnitude of industrial units is still on the increase and the development of integrated enterprises is very new. The exceedingly large part transportation plays in all manufacturing industry makes the development of units of transportation one of the most natural secondary developments in the integration of industry. Next after the acquisition of coal and

SURPLUSES AND SHORTAGES BI-WEEKLY, FROM OCTOBER 30, 1907, TO APRIL 15, 1908, INCLUSIVE.

	Surpluses.					Shortages.				
	Number of roads.	Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Box.	Flat.	Coal, gondola and hopper.	Other kinds.
April 15, 1908	153	138,065	23,811	160,205	53,689	375,770	83	7	1	55
April 1, 1908	158	111,748	24,774	120,669	50,316	307,507	319	117	8	84
March 18, 1908	160	103,509	25,122	119,205	49,206	297,042	533	151	250	73
March 4, 1908	162	103,905	27,232	139,223	44,632	314,992	943	19	600	57
February 19, 1908	161	113,776	30,088	134,217	44,432	322,513	697	141	249	162
February 5, 1908	158	112,046	30,312	156,634	44,936	343,928	737	281	15	67
January 22, 1908	161	124,622	27,328	142,338	48,292	342,580	392	132	79	135
January 8, 1908	163	149,664	23,087	127,138	41,874	341,763	457	34	42	120
December 24, 1907	158	87,714	14,740	64,556	42,300	209,310	187	81	191	265
November 27, 1907	160	16,246	3,645	10,028	10,429	40,348	11,908	868	2,964	2,224
October 30, 1907	161	786	600	1,285	1,275	3,946	61,592	3,546	15,987	9,632

of 26,317 in box cars, although the surplus is still considerably below the maximum for this class. Group 7 shows a slight improvement; Groups 1 (New England), 2 (Eastern), and 10 (Pacific), about hold their own, but there are increases in all other groups, the heaviest being in Group 3 (Middle), where the accumulation of idle coal cars is largest.

The Ocean Carrier.

BY J. RUSSELL SMITH, PH.D.

XVIII.

The Present Situation and Future Outlook.

Most of the factors which are now important in ocean transportation are factors in which there is progress. This is true both in the technical side which concerns the actual carrying of the goods and it is also true in the management side in which we find the transportation problems affecting law and public and economic relationships.

There are at least four aspects of the technical side which should be briefly referred to before taking up the more important or management side.

First.—The change of vehicle from sail to steam goes on apace. The general speed and celerity of modern business is violated by the irregular slowness of the sailer and the great size and economy of the modern steamship have long since enabled it to practically supercede all sail line traffic, and the last seven years of fierce competition in the shipping world has developed a steam tramp of such a size and such economy of operation that profit rarely hovers over the white wings of the sailer that tries to compete. The recent words of a British tramp vessel owner seem to be significant of its doom: "We still own five sailing ships but we find it very hard to make ends meet as steamers are getting into sailing ship trades. The passing of the sailing ship entirely as an ocean carrier is in my opinion only a matter of a few years."

Second.—The relative positions of charter and line traffic are both shown by the discussion of one, for the other has virtually all

ore lands by steel companies came the acquisition of steamship lines and railroads. The increasing knowledge of the world's resources, the limitations of local supplies are likely to make more and more reasons why the modern industrial corporation should have its own steamship service as a part of its equipment.

Fourth.—The railroad steamship line is also steadily increasing upon the surface of several oceans. It is also an accompaniment of the large scale enterprises, particularly those in which railroads are driven through vast and undeveloped territories and find their termini in ports of insignificant local trade. Another generalization may be pointed out, namely, that there is much greater likelihood of railroad steamship line development along coasts where the current of ocean trade is at right angles to the coast line rather than along the coast line. For example, the railroads to the Pacific coast of North America find the goal for their ocean traffic across the sea. The steamship line sails away from the coast; there is no temptation for it to pass other ports. In South America these conditions are essentially different. The commerce of both the western and eastern shores of that continent going up and down the coast passes all ports so that any railroad that taps that coast finds its terminal facilities within near reach of a stately procession of steamships which will gladly call for any reasonable amount of freight. The necessity of a South American railroad supplying its own oversea connections is therefore unthought of.

If there had been a similar coastwise development of transportation routes along the shores of the North Pacific to the only available markets our Pacific railroad steamship lines would probably never have existed. The conditions would have resembled those to be found in New York where every railroad that can get a terminal upon that splendid harbor is within reach of steamship connections to every quarter of the globe.

There is therefore a tendency for the necessity of railroad steamship lines to decline due to the development in other ports of many ocean lines, but there nevertheless remains and will remain a large number of ports which must be comparatively small because of the proximity of other ports, and for the small ports there will continue to be the need of railroad steamship lines.

The second main division, the management is one in which there

are also changes in progress. There is steady increase in the size of the carrying unit, the vessel and in the management unit, the line. Both are growing astonishingly and the end is not in sight for either unit.

It is around the question of rates—line traffic rates—that the greatest interest centers and the greatest problems lie.

We have no great changes to expect on the cost of service to the shipper. He is already accustomed to all kinds of rates, one might say all kinds of rates together, so greatly do they at times fluctuate. The real rate question is that of rate control. Will it be by the free force of competition or by the restraint of rate agreements?

To start with we have the fundamental factor of the freedom of the sea, which has, so far as line traffic is concerned, practically developed for much of the world ocean into a normal condition of rate control with frequent adjustments. This is the normal condition in the trade of Europe with practically all parts of the world except the United States. Furthermore, it has come to be the normal condition with regard to the rates from New York to most quarters of the world, and it is probably safe to say that there is visible a distinct movement toward the increase of rate control. If it comes to include the North Atlantic it has practically embraced the world. Several reasons for this may be mentioned:

1. The companies are steadily getting larger and the time has now been reached when the agreement of seven or eight interests would produce a minimum agreement that might hold if a satisfactory freight classification omitting grain and flour should be made.

- Will the greater part of the carrying trade upon the North Atlantic ever be controlled by stable agreements? As has been previously pointed out, the difficulties are many, but the chances of agreement seem better than they have ever been in the past.

2. The growth of the single port conferences is suggestive of the final control. The German situation described above is an overgrown port control with Hamburg as its point of origin. The London carriers have a better agreement than the Liverpool carriers, and it serves as a good example to those who have not agreed so well.

3. Grain, long the great staple of the eastbound trade, is now becoming of less relative importance in the trade, because of the great increase in manufactured goods. This freight change is favorable to rate control, because manufactures will stand a much higher and more steady rate than that paid by grain.

4. Recent improvements in ship building have practically emancipated the newer ships from their old dependence on grain. When they had to have it as ballast, they were willing to bid low to get it. Now the newer ships admit water into their ballast tanks, and they no longer depend on grain if it does not pay them as freight. The lowest mark in grain rates from New York to Liverpool occurred prior to 1890 before the general introduction of water ballast.

5. The losses of the last great depression in the ocean shipping business have brought home to the shipowning fraternity the necessity of some protection, and they have had some rather valuable object lessons in the various attempts that have been made to alleviate the situation.

There are some principles any freight agreement must observe. It must limit itself to a minimum and there must be rather frequent readjustments of rates and of traffic divisions. It is because of the necessity of readjustments of traffic divisions that most of these arrangements in other trades have come to their end. The steamship companies will probably have to do as the railroads do, agree on a rate, but compete in some of the other forms that competition may take, readjusting their agreements with resulting changes in conditions. The great trouble with these agreements is that a flat rate with insufficient business throws the traffic to the best lines and cuts off the poorest who at once begin to cut rates to get freight. The aim of the steamship rate agreements should be to maintain living rates and leave all parties free to grow and develop and then readjust without a resort to the rate wars which now come so easily. This is no simple task, and it is further complicated by the fact that it is impossible to establish and maintain a rate which prohibits the export of produce to a competitive market to meet regional competition. Those interested in shipping think that they have been more ready to make rate concessions for this than the American railroads. This has occurred in part because while the railroads, during the last five years, have been crowded with domestic traffic, the steamship lines have been sorely pushed for freight. The prompt concessions made by the Atlantic steamship lines have unquestionably rendered a valuable service to America's export trade. As one carrier expressed it: "If the hog crop in Austro-Hungary is larger than usual, it affects the provision market of the whole continent, and we have to reduce the rate on Chicago packing-house products to get them on the market. And the rate on southern cotton-seed oil is always the same as the rate on provisions."

This list of requirements as stated in the above paragraphs is essentially sound and its requirements bear upon human nature with a load almost as heavy as does the golden rule upon ordinary human conduct. The voluntary agreement is a weak thing and it must be so. Persons in the best of positions to know assure me

that these gentlemen's agreements are frequently broken under the pressure to get freight.

That means that agreements to be strong will be dominated by some strong central force, like the Hamburg-American line in the German-American situation, the International Mercantile Marine in the London-American situation, or the Union Castle Line in the United Kingdom-South African situation.

A group with such a leonine member is strong enough to make tremendous competition to repel a new rival. It has cost a million dollars for a firm to fight its way into the South African conference, and this money was for the fight, not for the capital.

When once these rate control groups are established, especially as in the case of the Hamburg-American Company, where one management does nearly all and has many services it develops a peculiar death dealing power in competition.

There is no indication that the present wave of government control of corporations for the benefit of the individual is likely to stop rate control upon the sea, or limit the monopolistic power that comes with the power to kill that results from the great size of the largest companies.

The British government has recently investigated the matter very thoroughly through commissions and the result was a surprising amount of condoning after the many fierce and bitter things that have been said against the shipping combines. Upon the American side of the water the situation seems at the present time even more hopeless so far as government is concerned.

The recent attempt of Messrs. Peter Wright & Sons, of Philadelphia, to secure the aid of the Interstate Commerce Commission against the encroachments of the Hamburg-American Steamship Line is an interesting proof of this point. Their appeal for relief against pooling and rate control in restraint of trade has been denied. The closing words of the decision of the Commission are as follows: "This ruling is the only one which is consistent with what seems to be the policy of the law, viz., that while restriction and control are essential as to the inland carriers of foreign commerce, the ocean carriers of such commerce should remain unrestrained and free. There is not to-day, and never has been, such a thing as stability of rates upon the water. Perhaps it is not desirable that there should be. The ocean is a highway free to all. No franchise is needed to sail the seas, nor is the establishment of a line, of ships founded, either in law or in economics, upon the theory of a public serving monopoly which underlies the relation of the railroad to the state. It may well be, therefore, that without regulation and by reason of natural competitive conditions, the public will be best served, and in the end treated more equitably, by leaving the water carriers to foreign lands entirely unhampered by legal restrictions such as the people of this and other lands have found it necessary to impose upon the railroads. Under the ruling here made the fluctuation in the total through rate charged from an inland point in the United States to a European or Asiatic country will fall, where, in fact, the fluctuation is at the seaboard. The competition in rates will thus manifest itself where the competition really exists, and where the law presumes it will unrestrictedly continue, viz., where the ships bid against each other for cargo."

It is most unfortunate that the lawyer has to make our laws, for the legal mind dealing with precedents is like its Latin words, fed by the medieval past and constantly striving to control and interpret present conditions in the terms of the long dead past. It is notorious that legislatures talk about railroad transportation and legislate about it with the idea that the business is as competitive as the selling of horses and wagons at a public vendue and here we see the Interstate Commerce Commission referring to the law's vision of the freedom and free competition of the sea "where ships bid against each other." This vision seems well nigh ludicrous when inspired by the Hamburg trade of the Hamburg-American Company, which it is well known has long had a wonderful control over almost the entire line trade of the port of Hamburg with the North American continent.

This legal view point entirely overlooks the fact that there can be control through agreements where competition is theoretically possible and there can be the most emphatic kind of control through the development of one interest that has such great size that it can destroy by competition any ordinary new beginner in any field, and it can do this with profit to itself because with the great scope of its business it can be making money with eight or nine-tenths of its organization and losing money over the remaining fraction where it is effectively killing a competitor.

Just how far this rate control is going to go and how much it is likely to cause hardships through excessive rates it is difficult to predict. Unrestrained competition is usually disastrous to carriers, and monopoly is not noted for its reasonableness.

The opportunity and limitations of the individual and the way line competition soon works around into rate control are all well illustrated by a recent episode in the trade between New York and the Orient. The lines to this quarter of the globe had a good agreement to which they were holding with considerable firmness and to the irritation of many shippers. One of these shippers happened

to be the United States Steel Corporation (the largest individual in the world), which in the year 1907 had contracts for the delivery of 100,000 tons of steel goods in Manchuria. This was a splendid nucleus for the founding of a new line in a trade where the ordinary vessel carried about 6,000 tons of freight, but inasmuch as there was prospect of other orders, the company itself was in a position to furnish more than half the cargo for a fortnightly sailing. Accordingly arrangements were made with European owners for the founding of a new line to China. As the steel goods furnished all the heavy cargo that the ships needed, the managers were in a position to make very keen competition for necessary light cargo to finish filling the space in the holds of every outgoing vessel. After a few months of this competition, the new line was admitted to the conference. By this agreement with the other members of the conference, competition ended, and the steel company got the full rate for the outside cargo which its vessels carried, and it of course got this much more advantage for the carrying of its own goods.

Rate agreements, or some form of rate control, with frequent readjustments are the normal thing in all important trades but the North Atlantic, and are the existing condition in a considerable part of that, and the prediction is made that this will increase. One of the two great traffic classes, namely, the passenger traffic, has a normal condition of rate agreement and is a constant and shining example for the warring makers of freight rates. Two causes are conspicuous in explaining the difference between the extent of passenger rate control and freight rate control. One is the question of ballast, the other of the great fluctuations in the amount of traffic.

Ballast.—For a long time, every ship that sailed the ocean had to get some heavy cargo from New York (usually grain) to make her ride well. There is now less need for this because of the construction of ships with water ballast compartments, but this ballast factor yet lingers in the making of freight rates because there is always a desire to get a certain kind of freight to complete the vessel's cargo. If she is full of heavy goods a little light goods can be put in and the rate be cut to get them. The reverse may be true for other kinds of goods for the ship in the next pier. Hence the constant tendency to cut rates. The passenger accommodations of a ship have no such shifting utility. They can be carried empty or full and it makes no difference to the navigation of the ship.

The fluctuations of passenger traffic.—There is no important body of passenger traffic where there is not at some season all the ships can carry and at some other season but a fractional part of this amount. Therefore this seasonal and absolute inability of all ships to get their full quota brings them annually face to face with the problem of rate cutting. If they start to cut the rates to get passengers they can come down and down to absolute cost and still most of the carriers cannot get the traffic. Therefore they have annually had this problem to face and they long ago found that wisdom demanded that they should restrain the desire to compete, for it could but lead to loss for all; hence the virtual constancy of passenger agreements.

In a period of almost uniform loss in 1902 we saw the same reasoning bring about a minimum freight agreement between carriers running 46 services between the North Atlantic and United Kingdom. There are good reasons why this will have many successors. At least two factors are of importance to make reasonable the expectation of this increase. First is the great tendency toward the decline in weight of the American trade with Europe. Our increase in population and industries are generally recognized as being factors which through our increasing demand for food and raw materials will cause a decline in the bulk of our traffic with Europe; certainly a decline in relation to its value, if not a positive decline in bulk.

Along with this there has been a tremendous increase in passenger traffic, both of the pleasure class and from the movement of labor which has lately taken developments which show us that we have an international labor market. Not only can prosperity in America call a million workers a year from Europe but the same prosperity will send scores of thousands of them back to winter with their friends in pleasant Europe, while depression in America sends hundreds of thousands back across the Atlantic possibly to stay, probably to return upon the next call of high wages, which call can be heard very promptly through millions of letters from friends scattered in almost every county in the United States.

This passenger increase and freight decrease is showing itself in the positive decline of purely freight lines from New York and in the great prominence of large steamers of medium speed which can carry surprising numbers of passengers or tremendous quantities of freight. Many of them go further and have considerable space which is useful for either freight or passengers as the exigencies of the trade demand.

This increased importance of passenger trade will bring more and more before the minds of trans-Atlantic carriers, particularly those from New York, the importance of agreements in their operations as evidenced by their passenger agreements. Further, the great amount of shipping that the passenger traffic demands is likely

to bring with increasing frequency those periods when the amount of freight is utterly insufficient for their capacity so that they are with regard to freight as with regard to passengers in the dull season—not enough to go round, and if they choose to cut each other's throats by striving for the fraction that exists they can do so and still make little or no profit out of it. The freight business is becoming a by-product of the passenger business, with a tendency to share its rate control.

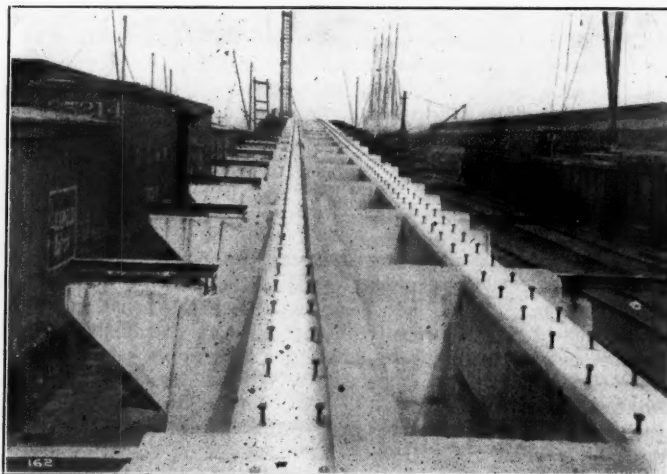
The Mediterranean is the first region in which these conditions have been developed to their fullest. Here the increase of passenger business has assumed unprecedented proportions and the freight has had a similar astonishing decline from the great development of the American fruit business in Florida and California which has almost entirely cut off the greatest staple of Mediterranean freights to New York.

A recent agreement covering Mediterranean freights is the most natural consequence of the above. Therefore we may expect normal developments to produce an ultimate freight control in the North Atlantic approaching in method and force the passenger control which already exists, and it may be expected to start in the Mediterranean and gradually embrace the North Atlantic trade. The trade of the Gulf of Mexico with its great seasonal development of cotton and grain will be more difficult to control because of the greater importance of the tramp steamer in it.

(The end.)

Concrete Coal Trestle and Ash-Handling Plant.

In connection with the new power house which the Delaware, Lackawanna & Western has now nearly completed as a part of its Hoboken terminal station, a concrete coaling trestle and ash-handling plant have been built. The power house is south of the station tracks and a little beyond the center end of the train shed of the new terminal station. The purpose of the trestle is to form



Partly Finished Trestle before Power House Was Built.

an approach by which loaded coal cars may be taken to the level of the second floor of the power house whence coal is dumped to the space in front of the boilers. The trestle also serves as the support, on one side, of a steel structure which carries the trolley track of the conveyor for handling ashes from the boiler room. The rest of the structure is entirely of reinforced concrete.

As shown in the accompanying photographs, the trestle lies alongside of and parallel to a two-story coach house and material building just beyond the power house, on the ground floor of which the boilers are located. The power house is three stories high. Between the trestle and the building is the ash-car track, over which, for 130 ft., extends the trolley and its supporting structure. The trestle proper is 226 ft. 3 in. long, consisting of 18 bents on piers spaced 12 ft. center to center. The inner abutment is the wall of the power house and the outer abutment is the end of an approach 112 ft. 4 in. long. The surface of the whole structure, trestle and approach is on a 4 per cent. grade up to the last three bents toward the power house. Here a vertical curve is introduced between the incline and the level within the power house, into which the tracks are carried through an arched entrance on the level of the second floor. The approach is filled in between retaining walls tied together near the abutment by old rails 15 ft. long extending from one wall to the other and fastened in each wall by an 18-in. rod passing through the end of the rail and embedded in the concrete. Four of these rails are used, spaced 10 ft. apart. The walls are necessary because of the limited ground space, the tracks on each side being too near to let the fill take its material slope. From out to out, the structure is 16 ft. wide, about one-half this width being occu-

ped by a walk on each side. These are protected by railings of iron pipe.

The bents vary in height from that of No. 1, next the approach abutment, which is 11.32 ft. high, to No. 18, nearest to the power house, which is 19 ft. All are on piles on account of the nature of the soil, which is largely made ground. Footings are 4 ft. 9 in. wide and in length vary from 11 ft. 9½ in., at bent No. 1, to 13 ft. 1 in. at bent No. 18. The thickness is 3 ft., of which 1 ft. is filling between the tops of the piles. Each pier is 19 ft. wide and 18 in. thick at the top with a batter of 1 in. per foot in cross section of the trestle and ½ in. per foot in longitudinal section. On these

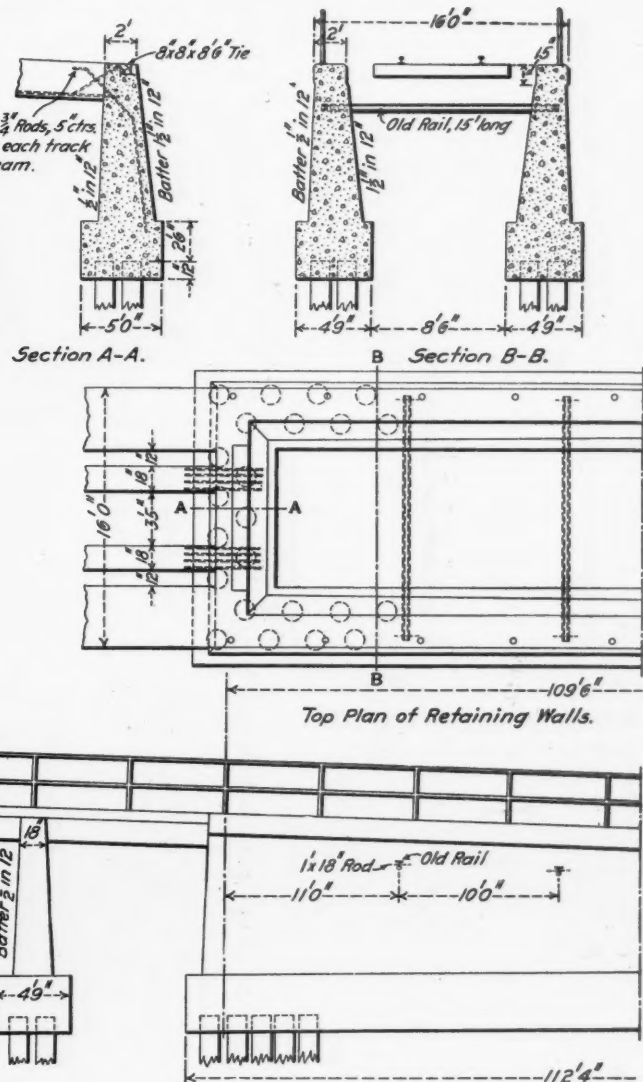
are concrete stringers, 18 in. x 27 in., in which are embedded ¾-in. bolts, 12 in. long, to which are secured the clamps which hold the rails in place. Ordinarily, in structures of this kind metal plates are put between the concrete stringer and the base of the rail. In this case, the plate was dispensed with and the indications are that this construction will prove satisfactory. The anchor bolts, however, project far enough above the stringer to allow for plates, should they subsequently be found desirable. Between the stringers and on each side of them open spaces, 3 ft. 5 in. and 12 in. wide, respectively, have been left, partly to separate the stringers which carry heavy loads from the floor structure which is of lighter construction, and partly to facilitate the dumping of material along the incline for any reason. This arrangement has already been made use



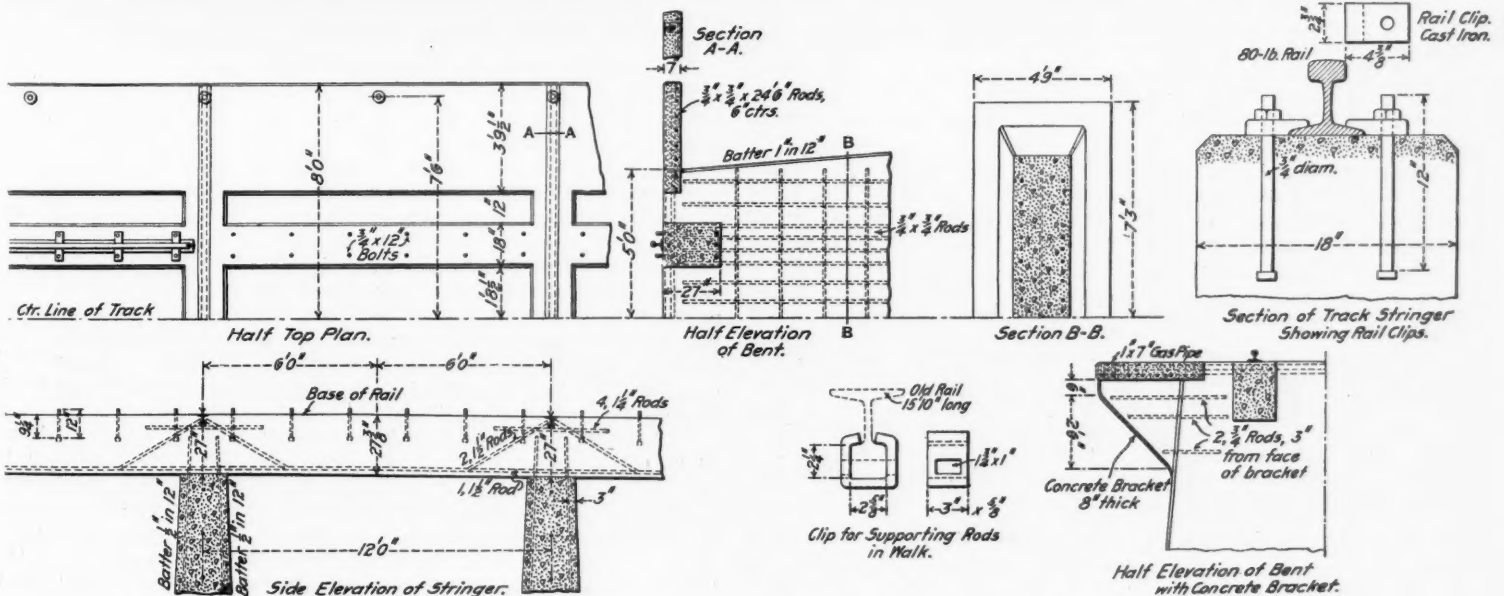
Side View of Trestle and Approach.



Trestle and Approach, Looking toward Power House.



Plan, Elevation and Sections of Approach.



Plan, Elevations and Details of Hoboken Coal Trestle; Delaware, Lackawanna & Western.

of in connection with the handling of construction materials for the power house.

The piers are reinforced by $\frac{3}{4}$ -in. square rods placed vertically in two rows 3 in. from the outside of the pier, spaced 5 in. apart underneath the stringers, and 8 or 9 in. apart outside of and between the stringers, by similar rods are laid horizontally, spaced 18 in. apart. The stringers are reinforced by three $1\frac{1}{4}$ -in. square rods laid with centers 3 in. from the bottom of the stringer. Over each bearing point the upper part of the stringer is reinforced by four rods, each $1\frac{1}{2}$ in. square and 8 ft. 4 in. long, and on these upper rods an inverted rail, extending the width of the structure, rests at each bent. On each side of this rail, abutting against the flange and web, are two $1\frac{1}{4}$ in. square rods, extending to the lower reinforcement at an angle of about 35 deg. with it.

In the construction of the sidewalks, a novel method was used. The cross rails above referred to are the principal means of support. These rails, as stated, extend to the outer edge of the sidewalk. At intervals of 6 in., clips of the form shown in one of the drawings are attached to and hang from the head, and through openings in each leg of the clip are passed the rods which form the horizontal reinforcement of the sidewalk. As shown in the cross-section, the sidewalk on the outside away from the power house, has no other support than that just described; on the opposite side, a bracket 8 in. thick, tied to the pier by reinforcing rods,

in operation this will give direct connection between the railroad systems of Scandinavia and of Germany.

Russian journals say that foreigners are beginning to develop the meat production of Siberia, for which the railroad gives an outlet for the first time. Germans are raising, fattening and refrigerating cattle and sheep; and Englishmen, hogs and geese. Such production and preparation as was common to the natives furnished a product which foreign markets would not accept. There is an enormous field for the development of these industries—many times greater than that fit for grain production.

Construction of the St. Michel Station of the Paris Metropolitan Subway.

BY E. OMMEGANCK.

The construction of the St. Michel station of the Paris Metropolitan Railway is illustrated in the accompanying photographs. This station is under one of the boulevards of Paris. As it had to be built in water-soaked ground, the ordinary method of excavation could not be used. Neither could shield construction be used, because of the large dimensions of the station. The work was therefore done by caissons sunk vertically. These caissons were like



The St. Michel Station, Under Construction, Showing One of the End Caissons; Paris Metropolitan Railway.

is formed to serve as a support opposite each bent. This bracket is solely for the purpose of giving additional support to the columns on which the cross-beams of the ash handling plant are carried. The other extremities of these beams are supported in the wall of the power house extension.

The trestle was designed and built by the engineering department of the Delaware, Lackawanna & Western, Lincoln Bush, Chief Engineer, and George T. Hand, Assistant Engineer, to whom we are indebted for data and illustrations.

Foreign Railroad Notes.

The first section, 360 miles, of the road from Rio Janiero, Brazil, to Goyaz, 630 miles, has been opened.

The Chinese are building on their own account and with native engineers a railroad from Pekin northwest to the great wall at Kalgan. It is reported that in January a tunnel on the route caved in and killed 180 workmen.

Arrangements have been made for a railroad ferry between Lasznitz, on the island of Rugen, and Trelleborg, in Sweden, 63 miles. There are to be two ferry boats, each with a speed of 16 knots, and large enough to carry a whole train, after the manner of similar ferries on the Great Lakes in the United States. When

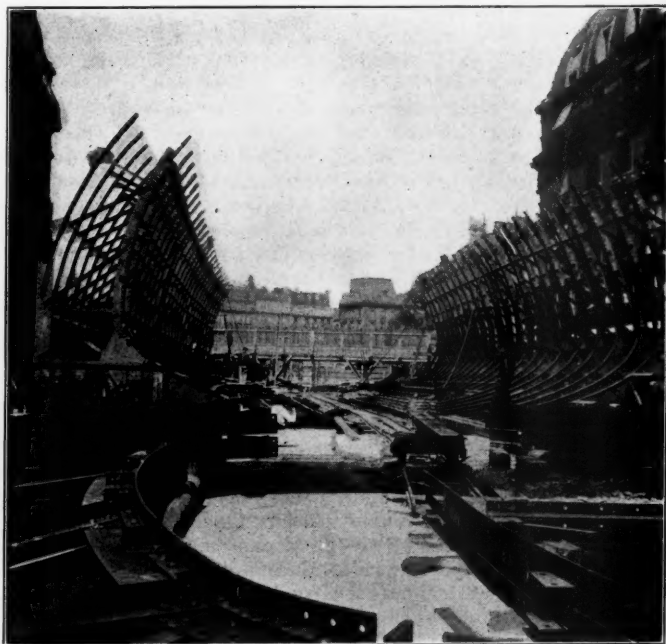
coverless boxes with air-tight walls entirely surrounding the work. They were first built over the place where they were to be sunk with a working chamber at the bottom to allow the laborers to excavate underneath the caisson, which was sunk progressively by its own weight as the spoil was removed. Compressed air was used to keep the water out of the working chamber under a pressure that increases with the depth. The upper or main part of the caisson and the working chambers were separated by a strong horizontal partition made air tight by a thick layer of concrete. Passage of men and materials back and forth between the upper part of the caisson with normal air pressure and the lower part under compressed air, was made through air locks at the end of vertical shafts which, of course, were longer the farther down the caisson had gone. The caissons were sunk gradually, and finally disappeared completely under the soil with which they were covered, the shaft alone extending through the soil.

The station itself is curved on a radius of 984 ft. It is made up of three caissons, 390 ft. long altogether. The center caisson is semi-cylindrical, 226 ft. long, 55 ft. wide and 41 ft. 8 in. high, containing the station proper. At each end an elliptical well connects the stations with the subway. The height of this well is the distance from a point 8 ft. below the lower part of the station to the level of the street. It contains the ticket office and stairs and elevators reaching to the passenger platform of the finished station.

The metallic frame of the large central caisson is made of trans-

verse trusses in the form of an arc of a circle, 4 ft. apart and connected by cross ties. On the cross ties are placed the jointed iron plates which constitute the external envelope of the work. The transverse section of this caisson forms a semi-circular vault with an opening 41 ft. 8 in. wide. Its height in the clear is 28 ft. 3 in. The station will be provided with two lateral platforms for passengers, with a space for trains 18 ft. 3 in. wide. The platforms will each be 11 ft. 8 in. wide and as long as the station, which is about 250 ft.

The walls of this large caisson are formed of iron plates $\frac{3}{16}$ in. thick, riveted to the outside shell and stiffened internally by angle irons. These angle irons have holes for reinforcing irons forming a bed for a layer of concrete. The concrete will be faced with white enamel tiles. All around this internal envelope, concrete will be poured to a depth of 3 ft. 3 in. at the key and 6 ft. 6 in. at the springings of the vault, entirely embedding the transverse trusses. Moreover the iron plates of the external shell, instead of following the round contours of the caisson, are set vertically at its sides and held by steel stanchions that will serve as webs between two parallel sustaining walls of concrete. The object of this arrangement is to prevent any movement of the ground during the sinking which might result in the settling of the surface of the street. The working chamber of this central caisson is separated longitudinally by a central partition which divides it into two chambers, each with four working shafts. By this means the sinking of this large caisson will be made more sure and regular. Such precaution is necessary, for it weighs at least 18,000 tons, of which 7,000 are concrete and 11,000 steel, and, by reason of the inequality of the ground, it is likely to get out of plumb or even to become displaced.



The Large Central Caisson Being Mounted.

The two end caissons, one of which is shown in the largest photograph, are identical. They have an elliptical internal section, the major axis of which is 86 ft. long and the minor axis 61 ft. They are to be sunk about 76 ft. beneath the street level. For 66 ft. of the height the walls consist of a double lining of steel weighing 650 tons. The 5-ft. space within this lining has counterforts and crossbraces and is filled in with 2,500 tons of concrete. Once in place, the continuous ring thus formed will be surmounted by a masonry coping $6\frac{1}{2}$ ft. high. This coping will support a strong metallic floor completely closing the work at the top. On this the roadway will be laid.

Working of the Massachusetts Stock Law.*

Strong complaints have been made to the Commission concerning the effect of the Massachusetts statutes which regulate the issue of stock by public service corporations. The opinion is widely spread among persons familiar with financial affairs that investment in these corporations is discouraged by our laws, and that money which should be invested in Massachusetts to the advantage of the public is attracted to other states where more profitable returns are permitted, with the result that such enterprises are sometimes altogether prevented, and when undertaken are often retarded in their development.

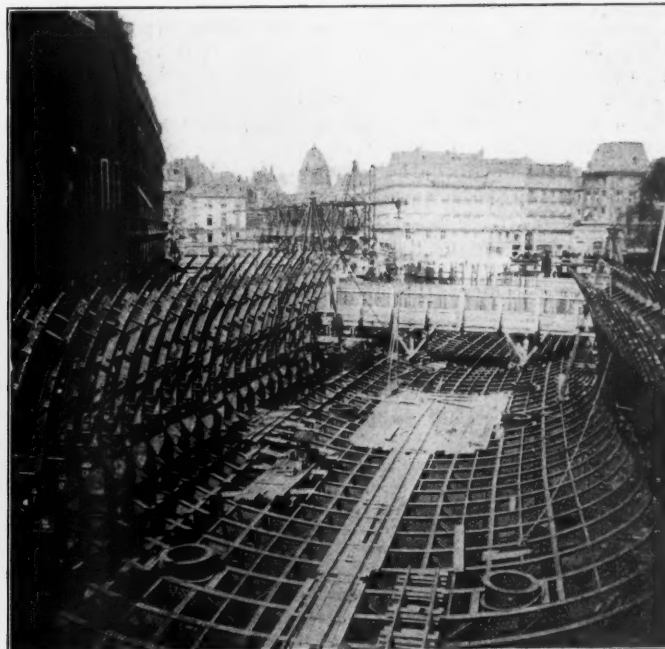
So far as concerns the laws which govern the inception of these

*From the majority report of the Commission on Commerce and Industry, Massachusetts, 1908.

corporations, and which prevent stock-watering by requiring full payment of par value in cash as a condition for the issue of stock, the Commission has heard little criticism and is satisfied that these requirements are salutary. While an opportunity to issue stock without such payment, or to give it as a bonus with bonds, as is permitted in some states, facilitates the raising of money for new enterprises, and may possibly be necessary in order to attract capital into a new and unsettled country, Massachusetts does not need to offer such inducements. No public service corporations bear a higher reputation as safe and conservative investments than those of Massachusetts, and her laws which prevent watering stock by an issue for less than par, and provide for supervising financial management, are generally accepted as models of wise state control, administered as they are by boards of commissioners free from suspicion of political influence or bias.

It is some of the provisions respecting a subsequent issue of stock when a public service corporation wishes to increase its capital that are questioned. There is, first, a requirement that no increase of capital be allowed except for a purpose approved by the Board of Railroad Commissioners. Of this no complaint has been heard, and in the judgment of the Commission it is in every respect wise. But there is a further regulation which forbids an increase of stock on the terms which apply to an original issue that is uniformly at par, and requires that if the stock has acquired a higher value the new stock must be issued at a price correspondingly advanced. This requirement, which first appeared in our law in 1893, is much criticised.

The course of our legislation on this subject has been as follows: prior to 1870 there seems to have been no regulation by general law,



The Large Central Caisson Being Erected.

each case being dealt with by special act, and the recognized principle seems to have been that issues of stock, whether made at the inception of the corporation or subsequently, stood on the same basis and were to be made at par; and in 1870 this principle was established by general law. The next year, however, a new method was introduced for railroad corporations, by requiring that when the new stock was worth more than par it should be offered at public auction; and this was soon extended to street railway companies.

This requirement of a sale at public auction was disapproved by the Board of Railroad Commissioners in their report for 1872, as seeming "to threaten results not contemplated in the passing of the act," and was declared to be "a reversal of the long-established policy of the commonwealth as regards its railroad corporations"; and the Railroad Commissioners proceed to criticise the act in these terms:

The theory of our legislation hitherto has been that the state needed both new railroads and the most complete development of all old railroads; the full accomplishment of both objects require large investments of private capital upon which the Commonwealth guaranteed no certain return, but it authorized a return not exceeding 10 per cent. if as much could be earned; in other words, a possible return of 10 per cent. was held out to induce private capital to enter into railroad enterprises, and this amount, if it could be earned, the law declared the community willing to pay. There is not a railroad in Massachusetts of any general importance which does not now stand in urgent need of additional large outlays to accommodate the growing business wants of the community. Especially is this the case, without any exception, with the lines terminating in Boston; the growth of the community imperatively calls for liberal outlays on the part of all of them. The former policy of the Commonwealth, by holding out a

prospect of 10 per cent. dividends on the new capital necessary to effect these needed developments, offered a strong inducement to the stockholders of the corporations to adopt a liberal policy and to go energetically forward with it. The act of 1871 in its practical operation cuts off this inducement by limiting the return of new capital invested in the development of all the leading lines of the state not at 10 per cent. but at \$10 per annum on the market value of the stock of such companies, thus reducing the return on new capital from 10 to 8 or even 7 per cent. Less inducement is thus held out to private capital to seek investment in the railroad system of Massachusetts than in any other state of the Union. In all of these the law authorizes a possible return of 10 per cent. as a minimum, and in many the limit is fixed much higher. It is therefore matter of consideration whether the act under discussion, by reducing the possible return to so low a point, will not cause those managing the corporations to become indifferent to a further development which cannot accrue to their own advantage, and to divert their capital to other quarters where it will be more liberally remunerated.

It is to be observed that since the report just quoted from was published, the holding out of 10 per cent. as a possible dividend has disappeared with the repeal, in 1874, of the law referred to by the Railroad Commissioners. There is now no statute restricting the power of the legislature to reduce tolls to be charged by steam railroads, so that the inducement to invest referred to above has been withdrawn.

The act requiring sale at public auction instead of an issue to stockholders at par stood (with an amendment not important to consider here) until in 1878 it was repealed for steam railroads, and in 1879 for street railways; and the law was then re-established as it had stood before 1871; that is, new stock was issued to stockholders at par. Thus re-established, the law was reaffirmed in 1882 in Public Statutes, and stood until 1893, when a regulation of a novel character were introduced. By this new provision it was required that, whenever a steam railroad or street railway company increased its stock by an issue exceeding 4 per cent. of its existing capital stock, the amount necessary for the contemplated purpose should be offered to shareholders at its market value at that time as determined by the Board of Railroad Commissioners, "taking into account previous sales of stock of the corporation and other pertinent conditions," any shares not subscribed for to be sold at public auction, but no share to be sold or issued at less than par. This act was amended by Acts of 1894, so as to cover gas, electric lighting, aqueduct or water companies and telegraph and telephone companies, and the law now stands substantially as enacted in 1894.

The introduction of this requirement for a sale of new stock at a premium instead of at par was referred to by the Board of Railroad Commissioners in their report for 1895 as establishing "a substantially new system of statutory regulation with respect to the increase and issue of capital stock." The Railroad Commissioners, without definitely expressing approval or disapproval of the new law, go on to observe:

The laws of this state have always recognized the right of the investor to an ample and even liberal return on the actual investment in railroad securities, such return to be made in the form of a regular cash payment of interest to the bondholder and a regular cash dividend to the stockholder. It is for the benefit of the public as well as the investor that this return be made more rather than less secure. Any cause of legislation that is calculated to reduce the revenue of the corporation to a point which does not admit of such return, and which does not moreover allow a margin of profit sufficient for the maintenance of a high standard of construction and equipment, is not only unjust but impolitic, as tending to discourage the investment of capital in legitimate railroad enterprise and to disable the corporation from rendering the best public service.

It appears from the successive enactments referred to above that prior to 1871 new stock issued by railroad corporations was to be offered to stockholders at par; from 1871 to 1878 it was to be sold at auction; from 1878 to 1893 it was again to be offered to stockholders at par; and since 1893 it is to be offered only at market value determined by the Railroad Commissioners, stock in street railway companies being regulated by similar legislation passed at nearly the same dates. We have therefore had 15 years' experience in which to judge of the operation of the present provision of law in its effect on railroads.

So far as known to the Commission, the provision in question was a novelty in corporate regulation in this country when adopted in Massachusetts. Since then our example appears to have been followed only by Maine and New Hampshire.

The theory on which the present law is based is apparently that it is for the public interest to keep new issues of stock as small as practicable, in order that the portion of profits to be applied to the payment of dividends may be kept down. It is assumed that by this means the tolls and charges paid by the public will keep at a minimum, and also that of the profits which are earned a greater proportion will be left available for improved service. It is asserted that an issue of stock in excess of what is actually necessary is stock-watering, and the law of 1894 which prohibits it is sometimes referred to as "the anti-stock-watering act."

It is undoubtedly a sound theory that the amount of the capital stock to be issued by a public-service corporation should be regulated by a law requiring each share when issued to represent what it pur-

ports to represent—a proportionate part of a capital authorized by law and actually paid in full. The evils of excessive capitalization, by issuing shares which have not behind them what they purport to have, which is properly called stock-watering, have been demonstrated by experience, and may be taken for granted. These evils are guarded against in Massachusetts by the long-established requirement that the stock shall be issued not below par, and for cash. Par is thus adopted as determining the normal and established value. From that point on the investor takes his risk of the market value increasing or diminishing as the enterprise goes on. Based on this par, the established proportionate value of each share is expressed in the certificate, by it is regulated the liability which each original subscriber is under to creditors, and with reference to it is determined the amount of bonds which the company is authorized to issue. By this and this alone should be determined what is a fair return of profit, whenever that question becomes material, since no other constant element exists by which the reasonableness of the return can be estimated.

Now, the provision introduced by the laws of 1893 and 1894 creates a fundamental difficulty. By requiring new stock to be issued at a price above par, it breaks in on the uniformity of the method of capitalization, with the result that it impairs the effectiveness of the control which the state can exercise in regulating the service to be furnished by the corporation. The declared object of keeping down the amount of shares is that a larger portion of the profits which might otherwise be paid out in dividends shall be applied in diminishing rates or improving service. Yet the moment that the state should demand such an application of profits, and insist that the rate of dividends should be reduced in order that the demand be complied with, it would be met with the proposition that the rate of dividend should be determined not by a reference to the par value of the stock, but by a reference to the higher price which the state itself has prescribed as a minimum. And this proposition would be reasonable.

Par being the established basis on which the rate of dividend is fixed and quoted, the state, so long as it does not interfere in the price to be paid, except to require that it be not less than par, is justified in treating par as the permanent standard by which the reasonableness of dividends shall be measured. Every one who buys in the open market buys on that basis, and takes his chance that the stock may go up or down, and the law pays no regard to market fluctuations. Though he buy at a premium, he cannot complain if the state subsequently deals with dividends by reference to the standard that it has itself fixed, and the only one that it has ever sanctioned or recognized. But all this is changed the moment the state prescribes a new and higher price. Every stockholder who has bought his stock at a premium fixed by the Board of Railroad Commissioners may properly insist that that price be taken as the basis in determining what rate is reasonable. For the state to forbid a sale below a stated price, and then refuse to recognize that price when it is proposed to regulate dividends, would be little short of bad faith; and any tribunal passing upon the reasonableness of rates charged, with a view to the stockholder's fair return, could hardly fail to find force in the contention that to ignore the price fixed by the state would approach confiscation. Nor would it be a sufficient answer to tell the stockholder that he had not been obliged to buy at all and, having bought, must take the consequences. This would do if he had bought in the ordinary open market, but not if he had bought at a price regulated by the state. The regulation becomes, in such a case, a part of the scheme of the enterprise into which the buyer enters; and if the state interposes the regulation for one purpose, it should not repudiate it for another purpose. Of course the state could expressly announce at the outset that, although the stock would be sold only at a premium, the premium was to be disregarded in all subsequent actions by the state; and this would free its hands. But how much stock could be got out in the face of such a warning may be conjectured.

By requiring a sale at a premium, it results that the state fixes, then, what becomes in effect a new par; and a new par not only for the particular stock now issued but, since all stock must stand on the same dividend basis and cannot be separated into classes, the new par is fixed for the entire capital stock. Thus it happens that for the sake of keeping down the number of shares to be issued on the occasion of some fractional increase, often a small one, the state has permanently estopped itself from treating any of the shares as having the par which it had originally fixed, and has advanced the measure of a fair dividend on all. In this way the law actually overreaches itself. A general advance of the dividend standard on all shares results, and this is tantamount, so far as the public is affected by dividends paid, to a stock-watering since it would increase the total of dividends to be permitted before public demands should be acceded to. This is the fundamental objection to recognizing by law any normal value other than par.

It is a misleading stretch of language to speak of issuing at par stock which commands a premium as "stock-watering." So long as it is issued for cash at par it conforms to every standard set by the state, and every standard which the stock certificate purports

on its face to require. To stigmatize stock as "watered" because it is not issued at a premium is to confuse the settled basis of capitalization and set up a basis varying with the prosperity of the company; and to do it, too, on a theory of the public interest, which, if we are right in our conclusion stated above, is short-sighted, because it weakens rather than strengthens the state's control at the point where it sought to sustain it.

Looking at the actual practical working of the law of 1894, there seems to be no doubt that it has worked badly, so far as concerns steam railroads, and apparently it is doing no good in street railways. The Commission has heard much condemnation of it from many quarters. The Commission on Taxation, in its report presented to the present legislature, confirms the conviction which this Commission had already reached, that the law is making it difficult to raise money needed for the proper development of our transportation facilities, and that report calls the attention of the general court to the need of legislation which shall lessen the severity of the present law.

The method now prescribed is unquestionably poorly adapted for raising money. It requires, first, that the Railroad Commissioners fix the market value, and this is usually difficult to do with any definiteness because quotations of sales of ordinary lots of stock furnish no proper criterion of the market value of a large block. Moreover, as the stock market is subject to wide fluctuations from causes quite independent of the intrinsic value of the stock, there is no assurance that a market price once adopted is to stand long enough to warrant any calculations of the result of a sale to be made in the future, when the necessary votes and other preliminaries shall have been arranged. The Railroad Commission is thus called upon to fix a price without definite or permanent facts on which to base its judgment. A recent experience of the Edison Electric Illuminating Company shows how impracticable a price carefully fixed by commissioners may become before the stock can be actually subscribed. After the commissioners have fixed a price the directors must offer the stock proportionately to shareholders, and as the price is purposely required to be fixed at a figure which precludes a special inducement to buy it is uncertain how much stock will be taken. Whatever is not subscribed must be sold at auction—a requirement which suggests to any stockholder that if he does not subscribe he may buy later at a lower price. An auction sale is uncertain, and in the case of a large block of stock has also the disadvantages of both of depressing the price and of carrying a substantial influence in the management of the railroad to any chance bidder—a prospect which neither the public nor a railroad management would look at with satisfaction. Meantime, the board of directors, which has a definite proposition on hand, is left unable to foresee how much money it is to have. Certainty on that point is so essential to proper financial arrangements that a competent board of directors would naturally make sure by a contract in advance that all stock not subscribed should be taken at some satisfactory price, but if an auction sale is to be interposed such an underwriting contract is difficult, if not impossible. Taken in all its parts the machinery which the present law prescribes for raising money for what is to be assumed to be a desirable public improvement is such as to make the process difficult and costly, if not impossible.

As might have been expected, railroad companies have been discouraged from raising money for large improvements, in the face of this law. The management of the Boston & Maine Railroad explains its backwardness in this respect as due almost wholly to this cause. Since the law was adopted there appears to have been but three applications made by railroad companies for a fixing of price, and the railroads have been driven, when making new issues, to resort to small issues of amounts less than 4 per cent. of their capital, since this can be done by sale at auction without the preliminary of fixing a price. Of the three applications made for large issues one was by the Norwich & Worcester Railroad Company, in 1899, when the price was fixed at 215; one by the Boston & Maine Railroad, in 1901, when the price was fixed at 190, and the third also by the Boston & Maine, in 1906, when the price was fixed at 165. The Commission is informed that the Boston & Maine Railroad was able to get out all its proposed issue in 1901, the market being favorable, but in 1906 the price was found to be so prohibitive that it never has been able to get out the entire issue. For issues of less than 4 per cent. of the capital the Old Colony Railroad Company has applied twelve times since 1893, the Connecticut River Railroad Company once, the Boston & Maine Railroad Company once and the Boston & Lowell Railroad Company twice.

Respecting street railway companies the actual effects of the law are less clear, the period since 1894 having been one of large investment in street railway enterprises throughout the country. While it cannot be said, therefore, that the starting of such enterprises has been prevented, it may still be true that the extension and development of the stronger companies, whose stock is at a premium, has been retarded, and it is asserted by many persons familiar with the situation that this is the fact. It appears that applications for new issues of stock of street railway companies have been made in 207 instances under the present law. Of these, however, 153 were

cases of issue at par, leaving only 54 cases of sale at a premium. It is difficult to say with definiteness how far the present law is actually retarding desirable extensions and improvements in the case of street railways, but in the opinion of the Commission it certainly is not encouraging development. It is desirable that public service corporations, when they are so prosperous that their stock sells at a premium, should be encouraged to look for opportunities for development, provided the new plan be approved as promising well for the public, and Massachusetts capital should be drawn into just such investments, rather than tempted away.

Aside from the difficulties experienced in marketing stock at prices fixed by the Commissioners, it is to be remembered that allowing shareholders the possibility of getting new stock at less than its market value offers obvious advantages to shareholders, and works as an inducement to put money into Massachusetts enterprise of this character. Looked at in this light the question whether the state should offer such an inducement is one of practical expediency. These corporations are trustees and agents for the public, but they do not carry on the public business on the terms applicable to private trustees, who are allowed reasonable compensation but are forbidden to make any profit from the trust estate. Public service corporations are in a quasi-partnership with the state. They are allowed to receive all the profits, but are required to charge only such tolls and furnish such service as the public may reasonably demand. It is at the point of tolls and services, then, that the public interest should be protected and public control applied, and so long as these are satisfactory the state should not limit the profits of railroads, since it is always for the interest of the public to have railroads prosperous. An unsuccessful company is the poorest public servant. The right to issue stock at par, in so far as it is a privilege of pecuniary value, is to be considered as a part of the compensation allowed to the corporation. As railroad matters now stand in this state, it is expedient, in the judgment of the Commission, aside from the reasons given above, to concede this as an element of compensation, and by this means attract capital to investment in Massachusetts public enterprises.

It may be suggested that if the law is to be modified it need not be changed to the full extent of allowing the company to issue stock which bears a premium to be sold as low as par, but that some middle course might be found which would secure to the corporate treasury at least a part of the premium, while leaving something as an attraction to subscribers. But every regulation which fixes a price other than par is open to the objections stated above. Moreover, it would be difficult to frame a regulation which should be less explicit than that now in force, and yet be definite enough to work satisfactorily. If the commissioners are to fix a price, but are not to have market value as their criterion, by what rule shall they fix it? Is there any basis which can be prescribed for all cases? If it were left to the commissioners to determine price, with no direction as to the basis to be adopted, the commissioners would either have to adopt for themselves market value as the most definite standard obtainable, or they would be obliged to make arbitrary decisions for which only vague reasons could be given and the whole method would lack the certainty and uniformity which are desirable in such matters. A sale at public auction, without any price fixed by commissioners, and without a privilege of subscription first offered to shareholders (which was the law in force from 1871 to 1878), is open to the objections that it deprives stockholders of all benefit of the premium as effectively as they are now deprived of it, and that it involves the risk of undesirable control pointed out above.

The Commission recommends that the law be modified so as to permit railroad and street railway companies, when authorized to increase their capital, to issue new shares to be offered to stockholders at such price, not below par, as the stockholders may vote, any shares not subscribed for to be sold at public auction. By this modification the law as it stood prior to 1871, and again between 1878 and 1893, will be restored. It is not to be assumed that new stock will always be issued under this permission at par if a higher price can be obtained for the treasury. Experience in other states where the law is open shows that it is common for companies whose stock is at a premium to issue new shares at a price above par, though low enough to tempt investors. This has been the practice of the New York, New Haven & Hartford Railroad Company in issuing shares under its Connecticut charter. But whatever price may be adopted it will be the action of the company itself which fixes it and par will remain for all purposes the fixed standard by which the reasonableness of dividends shall be measured when concessions are demanded by the public.

The present provision, which requires approval by the Railroad Commissioners of the purpose for which an increase of stock is to be made, will prevent, in the opinion of the Commission, an issue for any purpose not warranted by public necessity or convenience.

The recommendation made above is made irrespective of the recommendations in this report concerning the New York, New Haven & Hartford Railroad Company and the Boston & Maine Railroad. Whatever may be done in that matter the Commission con-

siders the change in the general law now recommended to be desirable.

The Commission has not examined the question of stock issues by public service corporations other than railroads and street railways with sufficient thoroughness to enable it to make any recommendation. Although the objections stated above are applicable in principle to an issue by any public service corporation at a premium fixed by the state, special considerations may apply, at least to gas companies, since the commodity furnished by these companies is susceptible of regulation on the basis of dividends paid, or otherwise, in a manner not practicable in the case of railroads, and special provisions of law for these companies may be expedient. That our laws are considered severe, however, by some public service corporations other than railroad companies is suggested by the experience of Massachusetts with the American Bell Telephone Company, which is understood to have left the state chiefly because of restrictions imposed by law on its capitalization and its power to hold stock in other companies.

Freight Car Balance and Performance for December, 1907.

The American Railway Association Committee on Car Efficiency has issued its Bulletin No. 22 covering Car Balance and Performance for December, 1907, the summary of which is given herewith. The committee says:

"A general decrease is noted in the total car mileage, ton mileage, and freight earnings, due to the prevailing business depression, and as a consequence the averages by which car efficiency is usually measured show a marked decrease. While the relief from congestion makes possible a higher mileage by loaded cars, and the homeward movement of empty foreign cars tends to accelerate their mileage, the increase is more than offset by the cessation of mileage by surplus cars.

"An approximate figure for cars actually in service may be obtained, however, by allowing for the idle cars reported in our Bulletins of Car Shortage and Surplus, and the increased percentage of cars in shop. These surpluses are as follows:

Per cent. of shop cars, December, 1907	5.57 per cent.
Normal percentage of shop cars (Jan.-Mar., 1907)	5.02 "
Excess percentage	0.55 per cent.
Average surplus cars December, 1907, 164,325.	
Per cent. of total cars	7.89 per cent.

Total per cent. surplus and excess shop cars... 8.44 per cent.

"Deducting 8.44 per cent. from the total cars for which mileage is reported, and applying the remainder to the total car mileage, an average of 23.9 miles per car per day is secured, which is very little lower than the normal average.

"The present rules governing freight car interchange are founded on the principle that every car owner has a right to the control of his cars, and each successive change in rules or rates simply emphasized this right. This principle, although based on strict equity, has had opposed to it the inevitable tendency toward a free interchange or common use of cars adapted to general traffic. The extent to which this natural tendency has prevailed over artificial regulations at variance with it, is denoted by the per cent. of foreign cars in use on all lines, which increased from 30 per cent. in 1904, to 41 per cent. for the first six months of 1907. The rate of rental for car hire which has not availed in times of car shortage to secure the car owner in the use of his property, operated immediately on the appearance of a car surplus to create a new difficulty, the excessive and useless cross haul of empty cars. The per cent. of cars on their home roads, which was but 56 per cent. during the first half of 1907, and only 54 per cent. during the month of April, 1907, averaged 64 per cent. in December, with indications that the homeward movement had only fairly started. This change was brought about only at great expense.

"The proportion of empty to total freight car mileage in December was 35.4 per cent. as against 27.1 per cent. in October. It is fair to assume that the average business can be handled with at least as low a percentage of empty mileage when the car supply is plentiful as during a period of shortage, and it would therefore appear that 8.3 per cent. of the total car mileage, or 117,287,407 miles, was absolutely unnecessary. It is impossible to calculate the cost of this enormous empty movement, but that it was a heavy drain on the already depleted revenues of the railroads, cannot be denied. It may be claimed that the saving made by individual roads in per diem balances justified the expenditure which this excess empty movement entailed, but the fallacy of this claim is apparent in the face of the fact that the gain by one line was necessarily offset by the loss to another. Further, in a majority of cases, the movement resulted in practically an even exchange of cars.

"Nor was this the only deplorable result. A great many roads took extreme measures to reduce the number of foreign cars on their lines and to force their own cars into service. Roads which had, during the period of shortage, gladly accepted cars belonging to affiliated lines, revised their rules when cars became plentiful and refused to accept cars not properly routing over their lines. Foreign

cars were in many instances stopped at junction points and their lading transferred to home cars. In other cases home cars were applied on loading to foreign lines, while foreign cars were sent home empty in the same direction. * * * The experience gained at such great cost may lead to the adoption of more flexible rules

Items.	New York, New Jersey, Del., Md., Eastern Pa.	New England.	Ohio, Ind., Mich., Western Pa.	Pa., W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Ill., Wisc., Dakotas.	Iowa, Minn., Dakotas.	Kansas, Colo., Okla., Ind. T., Mo., Ark.	Texas, La., New Mex.	Ore., Nev., Idaho, Cal., Arizona.	Canadian Lines.	Mexican Lines.	Grand total.
Revenue freight cars owned	38,927	47,484	278,741	134,730	166,053	376,515	16,122	137,504	26,222	106,665	96,989	585	2,020,365
Average number system cars on line	24,196	399,209	174,637	77,491	97,108	271,915	5,774	85,809	13,871	65,711	70,282	573	1,286,576
Average foreign railroad cars on line	23,288	210,251	82,801	50,320	56,510	96,089	16,255	45,771	28,214	62,994	23,938	2,130	698,561
Total railroad cars on line	47,484	609,460	257,438	127,811	133,618	368,004	22,029	131,580	42,085	128,705	94,220	2,703	1,985,137
Excess	8,557						5,907		15,863	22,040		2,118	
Per cent. railroad cars on line of total owned:													
Home	62	62	62	58	59	72	36	63	53	62	72	98	61
Foreign	60	53	30	37	34	26	101	33	107	39	25	364	34
All railroad	122	95	92	95	93	98	137	96	160	121	97	462	98
Private cars on line	1,469	40,722	14,400	2,829	7,006	11,165	1,622	5,309	2,401	8,086	3,830		98,839
Total, all cars on line	48,953	650,182	271,838	130,640	160,624	379,169	23,651	136,889	44,486	136,791	98,050	2,703	2,083,976
Per cent. of cars in shop	2.81	4.14	0.71	7.01	4.72	5.14	4.27	9.73	5.18	4.93	5.21	.35	5.57
Number freight engines owned	708	9,342	3,682	2,225	2,503	6,332	438	2,445	634	2,280	2,099		32,919
A. cars on line per freight engine owned	69	68	74	59	64	60	54	56	70	60	47	77	63
Total freight car mileage	25,039,620	455,223,345	159,085,040	77,467,918	108,705,482	249,522,045	24,156,097	84,348,811	30,087,493	114,035,678	84,960,116	469,650	1,413,101,295
Average miles per car per day	16.5	22.6	18.9	19.2	21.9	21.4	32.9	19.9	21.8	26.9	28.2	5.9	21.3
Per cent. loaded mileage	68.7	61.7	61.1	63.1	66.0	70.3	63.5	63.4	65.9	64.7	69.3	70.2	64.6
Ton-mileage revenue freight	230,405,031	6,283,764,569	2,001,578,059	840,387,148	1,007,096,978	2,011,449,734	315,735,394	970,173,049	352,889,232	1,575,306,187	1,050,522,926	7,439,634	16,646,747,641
Average ton-miles:													
Per car mile	9.2	13.8	13.4	10.8	12.4	13.8	13.4	11.5	11.9	13.8	12.4	15.8	13.1
Per loaded car mile	13.4	22.4	21.9	17.2	16.4	20.0	21.2	18.3	18.1	17.8	17.8	22.6	20.5
Per car per day	152	313	260	208	282	289	451	229	244	373	347	93	289
Gross freight earnings	\$2,548,923	\$37,720,582	\$12,512,000	\$6,691,942	\$9,197,947	\$17,470,635	\$2,921,118	\$8,880,650	\$3,181,866	\$14,359,445	\$6,924,631	\$113,611	\$122,523,479
Average daily earnings:													
Per car owned	\$2.11	\$1.90	\$1.45	\$1.60	\$1.83	\$1.94	\$5.84	\$2.09	\$3.90	\$4.35	\$2.30	\$6.26	\$2.65
Per railroad car on line	1.73	2.00	1.57	1.69	1.98	2.01	4.28	2.18	2.46	3.61	2.37	1.36	2.09
All cars on line	1.68	1.87	1.48	1.65	1.88	1.94	3.98	2.10	2.32	3.40	2.28	1.36	1.98

governing the use of freight cars in interline traffic. To the extent that such rules recognize the necessity for free interchange of cars, with such regulation as the principle of private ownership demands, to that extent will the future efficiency of freight cars be increased."

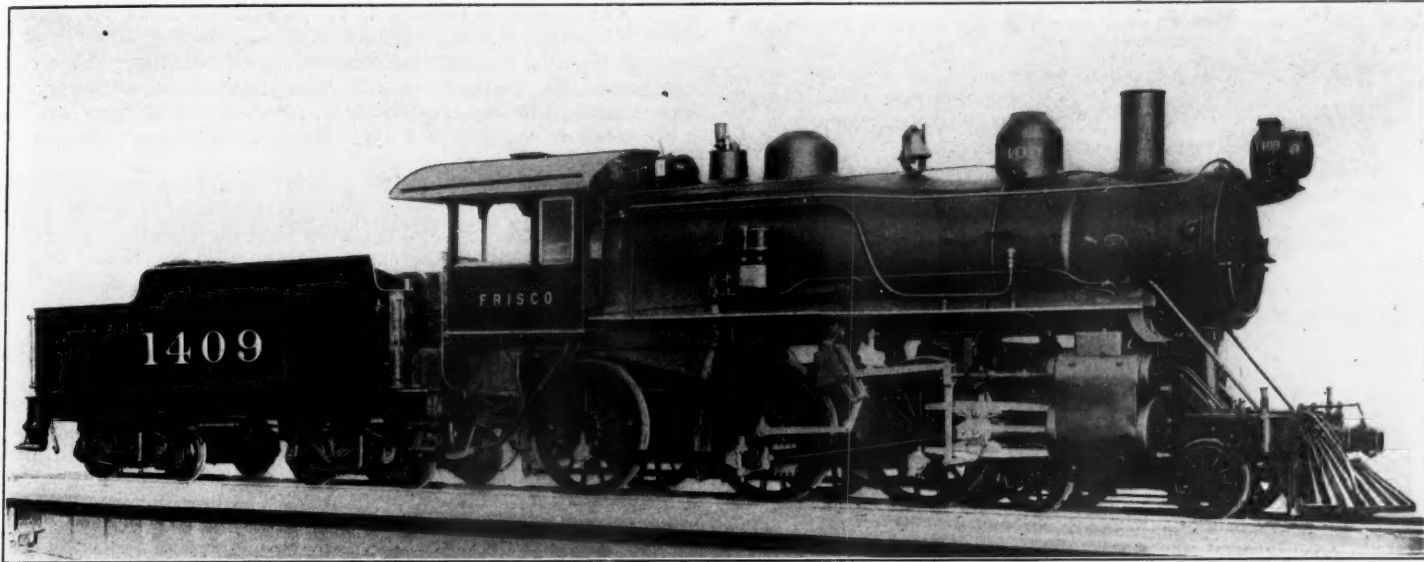
Ten-Wheel Passenger Locomotives for the 'Frisco.

The Baldwin Locomotive Works have recently delivered to the St. Louis & San Francisco ten passenger locomotives of the 10-wheel type. These are among the heaviest engines of this class thus far made by the builders, as they have a total weight of 194,450 lbs. in working order. The cylinders are 23 x 26 in. and the driving wheels 69 in. in diameter, the resulting tractive force with a steam pressure of 200 lbs. being 33,900 lbs. As the weight on the driving wheels is 141,050 lbs. the factor of adhesion is 4.16.

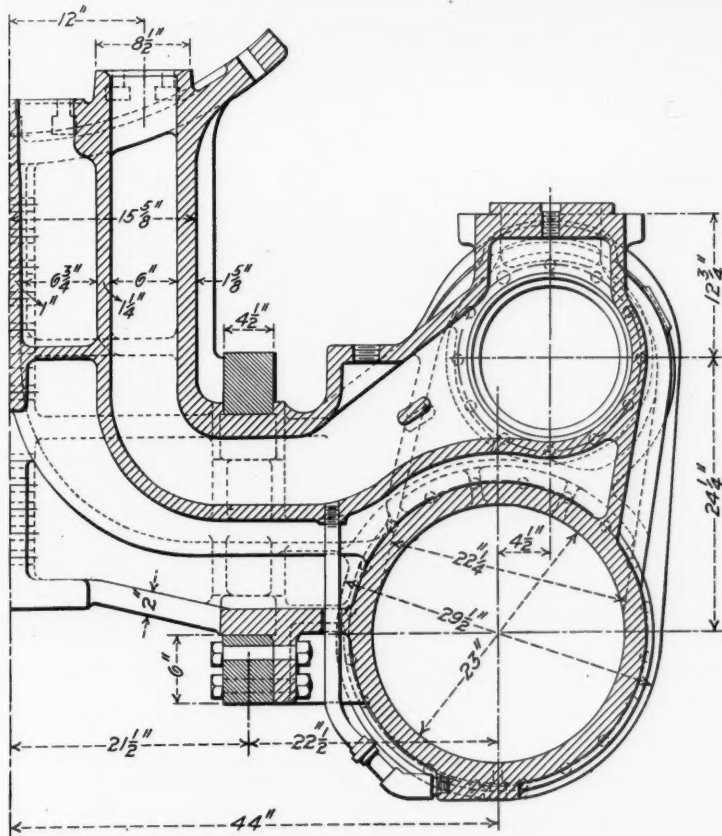
The cylinders are arranged for double front rails, and the castings are bolted to the smokebox and to each other by a double row

The center lines of the steam chests are placed $4\frac{1}{2}$ in. outside the center lines of the cylinders, thus making possible a simple arrangement of Walschaert's valve gear, with all moving parts in practically the same vertical plane. As the engine is equipped with inside admission valves the eccentric cranks follow the pins. The cranks are of cast steel, and are secured to the main pins by a tapered fit and through bolt. A substantial steel casting, secured to each frame by three $1\frac{1}{4}$ -in. bolts, supports at each end a combined link and reverse shaft bearing. The links are of the built-up type, with cast steel side plates. Each radius rod is made in one piece, the jaw which embraces the hanger and link block being slotted out. The combining levers are placed back of the cross-heads and are coupled directly to the valve rods, which are supported in bearings bolted to the guide yoke. The valves are set with a constant lead of $\frac{1}{4}$ in. and a maximum travel of 6 in. The steam lap is 1 in. and the exhaust clearance $\frac{1}{8}$ in.

The frames are of cast steel, $4\frac{1}{2}$ in. wide, with double front



Ten-Wheel Locomotive; St. Louis & San Francisco.



Cylinder of Ten-Wheel Locomotive.

of $1\frac{1}{4}$ -in. bolts. The valves are of the internal admission piston type, 13 in. in diameter, and work in bushings $\frac{5}{8}$ in. thick. The by-pass valve consists of a plate which rests on a horizontal seat, and normally covers openings leading to the live steam ports. When the throttle is open the plate is held down by boiler pressure which acts on its upper surface. Excessive pressure within the cylinder will cause the plate to lift from its seat, thus opening communication between the two live steam ports.

rails of wrought iron. The lower rail is double-keyed, while the top rail is hooked to the main frame, without keys. The pedestal binders are lugged and bolted to the pedestals.

The boiler is of the wagon-top type, with a wide firebox and sloping throat and back head. The center line is placed 9 ft. 8 in. above the rail, and the depth of the throat from the underside of the barrel to the bottom of the mud ring is $23\frac{1}{8}$ in. By spacing the second and third pairs of driving wheels 9 ft. apart ample room is secured for a wide firebox with a moderate inclination of the grate. The mud ring is supported on sliding shoes in front and a buckle plate at the rear.

The firebox is radially stayed, with two T irons supporting the front end of the crown. The roof and side sheets are in three pieces, with a double riveted lap seam on each side, while the crown and sides of the inside box are in one piece. The boiler barrel is built up of three rings, with the gusset in the middle. The longitudinal seams are butt jointed and sextuple riveted, and are welded at each end. The seam on the dome ring is placed on the top center line and is welded throughout its entire length, with a heavy liner inside.

The tender is furnished with a steel channel frame and water bottom tank. The trucks are of the arch bar type, with cast steel bolsters, triple elliptic springs and steel-tired wheels.

The following are some of the principal dimensions of these engines:

Cylinder, diameter	23 in.
Piston, stroke	26 "
Boiler diameter of shell	68 "
Boiler, thickness of sheets	$\frac{11}{16}$ in. and $\frac{3}{4}$ in.
Steam pressure	200 lbs.
Firebox, length	101 $\frac{3}{4}$ in.
" width	67 $\frac{1}{4}$ "
" depth, front	77 $\frac{3}{8}$ "
" depth back	59 $\frac{1}{8}$ "
" thickness, side, back, crown	$\frac{3}{8}$ "
" thickness tube	$\frac{3}{4}$ "
" water space, front	4 "
" water space, sides and back	$3\frac{1}{2}$ "
Tubes, number	364
" diameter	2 in.
" length	15 ft. 1 $\frac{1}{2}$ in.
Heating surface, firebox	172 sq. ft.
" tubes	2,867 "
" total	3,039 "
Grate area	47.7 "
Wheels, diameter, driving	69 in.
" truck	33 "
" tender	33 "
Journals, main driving	10 in. x 12 in.
" trailing	9 " x 12 "
" truck	6 $\frac{1}{2}$ " x 10 "
" tender	5 $\frac{1}{2}$ " x 10 "

Wheel base, driving.....	15 ft. 10 in.
" " engine	26 " 10 "
" " engine and tender	57 " 10 "
Weight on driving wheels	141,050 lbs.
" on truck wheels	53,040 "
" of engine	194,450 "
" of engine and tender	315,000 "
Tank capacity, water	6,000 gals.
Tank capacity, coal	12 tons
Tractive effort	33,900 lbs.

Weight on drivers	=	4.16
Tractive effort		
Total weight	=	5.74
Tractive effort		
Tractive effort x diameter of drivers	=	769.6
Heating surface		
Heating surface	=	63.71
Grate area		
Firebox heating surface	=	5.66*
Total heating surface		
Weight on drivers	=	46.41
Total heating surface		
Total weight	=	63.98
Total heating surface		
Volume of two cylinders, cu. ft.	=	12.5
Total heating surface	=	243.12
Volume of 2 cylinders		
Grate area	=	3.82
Volume of 2 cylinders		

*Per cent.

An Engineering Department Filing System.

The method of filing drawings in the engineering offices of many railroads is antiquated and unsystematic, and is a constant source of annoyance and delay within the department as well as without. When a managing officer asks for a drawing he wants it at once, and the engineering department should be able to produce it without delay. Under the system, or lack of system, followed in many offices, this is impossible. In addition to this important requisite, a satisfactory system should preserve the drawings in good shape and should be capable of being easily expanded. A system of this sort has recently been installed in the office of the engineer of maintenance of way of the Chicago & Eastern Illinois.

Special filing cases were designed, comprising units of two kinds: one containing shallow drawers and the other pigeon holes. The units are all 41 in. long, and all but one kind are 17½ in. high. There are three widths of pigeon hole units—15 in., 22 in. and 29 in.—and of the last there are two arrangements, one having the pigeon holes running the 29-in. direction and the other running the 41-in. direction. The larger drawer unit is the same size as the largest pigeon hole unit—41 in. x 29 in. x 17½ in.—and has eight drawers 1¼ in. deep. The small drawer unit is 9½ in. high and has four drawers, 3½ in. deep, arranged in two tiers of two drawers each. The pigeon-hole units are divided into an upper and lower story, each of which is closed by two sliding panels running in parallel grooves, so that only one-half of the opening can be uncovered at one time.

In the large drawers are placed the larger drawings, like right-of-way maps, according to the system of indexing to be described later. For the pigeon holes the drawings, which are tracings of course, are rolled around cardboard tubes ⅝ in. in diameter, with closed ends. There are three different lengths—18 in., 26 in. and 38 in.—and midway of each is pasted, by one end, a strip of unprepared Hyperion cloth, about 5 in. x 10 in. for a 26-in. tube. This is rolled in with the tracing to keep the latter from slipping on the tube. A circular sticker on the end of the tube carries the filing numbers, which are made with a rubber stamp. The only rolled drawings not put around tubes are profiles, their length making a tube unnecessary. A blueprint copy is kept in the pigeon hole with each profile tracing to save too frequent handlings of

the latter. The original drawings of all of the tracings in the filing cases are kept in a vault.

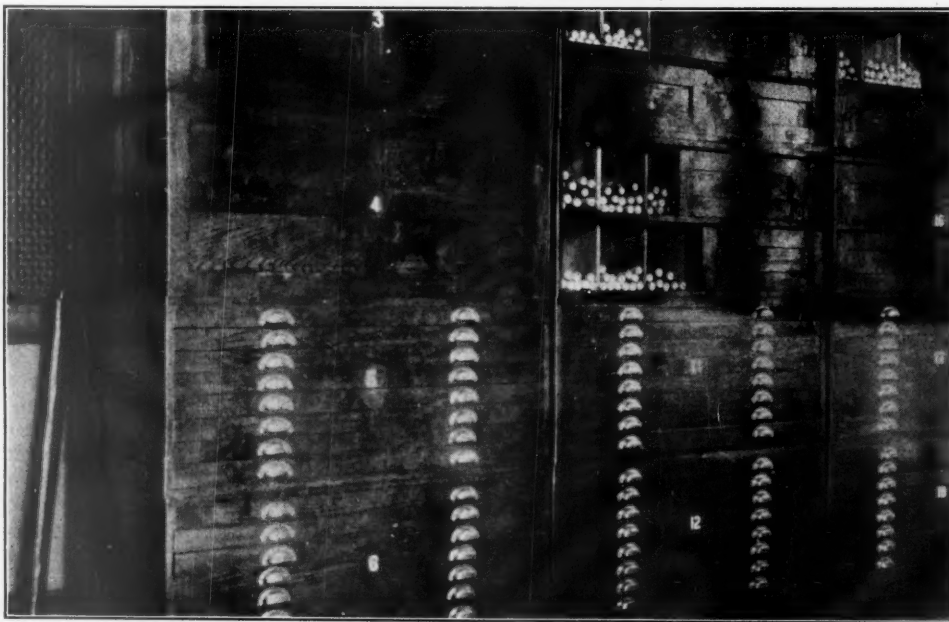
The small-drawer units are intended for miscellaneous small drawings such as sketches, small maps, etc., which are either legal size (8½ in. x 14 in.) or correspondence size (8½ in. x 11 in.). Also a stack consisting of a small-drawer unit, a 29 in. wide pigeon-hole unit and a base is put under each drafting table. In the pigeon-holes are kept drawings on which the draftsman may be working, or using for reference, and in the drawers are kept drawing instruments, material, papers, etc.

The drawings are indexed in station order, and also according to classification; therefore much that appears in one is cross-indexed in the other. There are three divisions of the road, each with branches. The stations are taken in order on the main line first, and then each branch in turn. For the more important points, where there are a great many drawings, the index is split up into subjects. As already mentioned, much that is in the "classification" index appears in the "station" index also. However, there are some things that cannot be indexed in the "station" file, as, for example, charts, diagrams, reports, forms, tables, statements, etc. The card gives all essential information concerning the drawing. For a right-of-way map, for instance, it will show the division or branch, the town, county, mile-post, scale and file number. These maps are kept in the large drawers, as already mentioned, there being one drawer for each county.

A photographic view showing both the drawer and pigeon-hole units is reproduced herewith. The units numbered 3 and 4 open at the left-hand end, the sliding panels showing plainly. The opened cases show the ends of the cardboard tubes on which the tracings are rolled.

In the index cabinet are three vertical file drawers in which are kept current records of side-track changes, there being one drawer for each division of the road. These changes are recorded on a regular blueprint form of legal size, and a blueprint map showing the change is attached. The office tracing is changed to correspond, and a notation of same made on the record. These drawers will hold a year's records, after which they are removed and placed in Shipman binders.

The C. & E. I. system of indexing has been made as compact as possible, a feature that its users consider a great advantage. Instead of one entry to a card, as with some systems, as many entries as possible are made on a single card. The cards are 4 in. x 6 in. and are ruled with 13 lines. It is claimed that less time is



Filing Cases for Drawings; Engineering Dept., Chicago & Eastern Illinois.

taken to glance over a dozen entries on a single card than to look at a dozen cards. It is absolutely essential, of course, that the index be kept up to date. The C. & E. I. engineering officers are much pleased with the system and say that it has justified its cost many times already in the short period it has been in use.

It may possibly console some of us who have been impatient because sundry railroad terminals have been some years under way and are not yet completed to know that we have company in our misery. In 1878 a commission was appointed to report on what should be done to remedy the totally inadequate facilities of the passenger station in Copenhagen. In 1903 the Minister of Public Works submitted plans for a new station. Recently work was begun on it, and it is to be something fine, costing little less than \$7,000,000; it is to be completed in 1915.

GENERAL NEWS SECTION

NOTES.

The railroad commissioners of Massachusetts have declined to recommend that every street railway car be provided with a lifting jack.

The Southern Railway has decided to employ train collectors on its passenger trains generally throughout its lines, and has appointed as superintendent of the department R. W. Hunt.

The West Jersey & Sea Shore has announced an increase in passenger fares, taking effect June 1. Between Philadelphia and Atlantic City the round-trip rate will be advanced 25 cents.

The railroads of Mississippi, with the approval of the State Railroad Commission, are now issuing 1,000-mile books, good for families, at \$25. The principal roads also issue 2,000-mile books at \$40.

The railroads in the Transcontinental Passenger Association have abolished second class fares, so that henceforth passengers riding in tourist sleeping cars will have to pay at the first class rate.

Through passenger trains are now running between St. Paul and Spokane over the Canadian Pacific and the Spokane International. These trains were taken off about four months ago on account of the light traffic.

The Atchison, Topeka & Santa Fe has just opened at the Needles, Cal., a new hotel, "El Garces." The hotel cost approximately \$250,000, and is one of the finest station hotels on the line. The building is of reinforced concrete, 518 ft. long and two stories high.

On the Pittsburgh division of the Pennsylvania two helping engines are now used with some of the heavy freight trains ascending grades, instead of one, as heretofore, thus increasing by 50 per cent. the number of cars that can be taken in a single train.

The railroads in the Central Passenger Association, in deciding to make a reduction of 25 per cent. in the round-trip rates to large conventions during the present year, voted to grant this allowance only for occasions where 1,000 or more passengers will be likely to want the reduced rate tickets.

At Spokane April 22 the Northern Pacific was fined \$4,000 in the Federal Court for violation of the law forbidding carriers to keep animals in cars over 28 hours. It was shown that on two separate occasions the company had carried large shipments of cattle and sheep for many hours without water, feed or rest.

The State Railroad Commission of Texas has suspended the order which it issued some time ago requiring the Missouri, Kansas & Texas to buy 165 engines and 6,000 freight cars within three years, the railroad company having shown that it has a sufficient supply of cars and engines for the present amount of business.

The appellate division of the Supreme Court of New York has affirmed a decision awarding \$120,000 damages against the Long Island Railroad for fires caused by sparks from locomotives. The decision is said to have been based on the neglect of the railroad company to burn all brush and other inflammable matter along its right-of-way twice a year, as required by law.

It appears that the 18-hour New York-Chicago train of the Pennsylvania road runs so slowly that it has been getting in the way of other trains! This we learn from a Chicago press despatch. The incident which gave rise to this statement was the running of a special train of four cars, carrying a theatrical party, on May 3, from Pittsburgh to Chicago in seven hours 42 minutes. This is almost exactly a mile a minute for the whole trip, the distance being 468 miles.

Near Walkers Mill, Pa., on the Pittsburgh, Cincinnati, Chicago & St. Louis, about ten miles west of Pittsburgh, Pa., on the night of April 30, the express messenger on westbound train No. 25 was overpowered and bound by robbers, and a number of bags of gold and other valuables were stolen from the express car. It appears that the robbers must have boarded the train at Pittsburgh, and they succeeded in stopping it and escaping before anyone but the express messenger knew of their presence on the train. On the same day a robbery of \$63,000 from a Wells-Fargo express car on a railroad in Mexico was reported.

The Attorney-General has begun proceedings against 15 carriers for violations of the Safety Appliance Act reported by inspectors of the Interstate Commerce Commission. The companies are the following: Atchison, Topeka & Santa Fe; Baltimore & Ohio; Buffalo & Susquehanna; Buffalo, Rochester & Pittsburgh; Cleveland, Cincinnati, Chicago & St. Louis; Delaware, Lackawanna & Western; Erie; Illinois Central; New York Central & Hudson River; St. Louis, Iron Mountain & Southern; Seaboard Air Line,

Washington Southern; Philadelphia, Baltimore & Washington; Southern, and Wiggins Ferry Company.

The Chicago, Milwaukee & St. Paul has organized the Continental Telegraph Company and the Continental Express Company, organizations which it is said will take and manage the telegraph and express business throughout the lines of that road. The contracts of the Western Union Telegraph and the United States Express Companies with the St. Paul road have expired, or will soon expire, it is said.

Samuel Rea on the Industrial Situation.

The *Wall Street Journal* quotes Samuel Rea as follows: "While I fully appreciate the present situation, which seems to me to be about as follows:

1. Business is seriously depressed—as it must be following a decided break in confidence;
2. Conditions are affected by the forthcoming Presidential election;
3. There are more idle railroad cars than since the inception of the panic, and from the railroad standpoint business can scarcely be worse.

On the other hand, every business man must not forget that:

1. This country is sound at the core. There has never been a time following a panic when the country had a better outlook;
2. There is no longer any question, as there has been in former panics, that the country is on anything but a gold basis.
3. Stocks in all lines of trade are depleted, which means that large orders must be given when demand arises.

We need a return of confidence and this requires time, patience and economy, both private and corporate, and especially do we need federal, state and municipal economy, because business retrenchment set in a year ago. We now have an indication of a return of confidence, and everything possible should be done to encourage it. The outlook for crops so far is good, and it would not be unlike the usual good fortune of this country to have in this particular year, when they are so badly needed, bountiful and profitable crops. It is, therefore, the duty of citizens to continue in a conservative and cheerful frame of mind, and to think, read, write and do only such things as will banish pessimism and timidity, which are no longer justifiable."

Telephones for Train Despatching.

The Chicago, Milwaukee & St. Paul is preparing to install telephones for train despatching between Chicago and Milwaukee, 85 miles, and between Chicago and Savanna, 138 miles. On the Chicago, Burlington & Quincy, between Aurora and Mendota, train orders are handled by telephone in the same general way as with the telegraph, except that the dispatcher instead of sending the order and then copying it in the order book on the first repetition, now copies the order in the book as he talks it off. He thus gages his speed of conversation to his ability to write so that the receiving operator is not likely to be "rushed" beyond his ability to make a legible copy. All figures in the body of the order are spelt out, as for instance, "Engine 1,124—one, one, two, four," and on single-track the names of the stations are spelt. The operators in repeating observe the same rule as regards spelling out of figures and names. At unimportant stations where an operator is not always on duty a set of telephone instruments is maintained so that a conductor can, if necessary, communicate direct with the dispatcher and get an order.

Sixteen Months Under the Revised Rate Law.

Logan G. McPherson has made a two weeks' study of the complaints on file with the Interstate Commerce Commission and finds that, judging by the number of cases and the results, comparatively satisfactory service has been given by the railroads. Mr. McPherson found that in the 16 months from August 29, 1906, to Jan. 1, 1908, 5,952 complaints were filed with the Commission, the total including, presumably, all long standing grievances which had been held back owing to lack of confidence in the efficacy of the law as it was before the 1906 amendment. Of this total 2,105 were on matters not coming within the jurisdiction of the Commission. Of the remaining 3,847 complaints 3,374 were informal and 473 formal.

The informal complaints are taken up by the Commission with the railroad companies and adjusted without a set hearing. They refer almost entirely to oversights, clerical errors and misconstructions of tariff. Of the total of 3,374 in this class, practically one-half were adjusted by the carriers after correspondence with the Commission and the other half were dismissed by the Commission

for lack of cause. Twenty-five of the 473 formal complaints apply to express and sleeping car companies. Of all the formal complaints considerably more than half are what Mr. McPherson designates as unimportant—that is, complaints that affect the transportation charge on but one shipment or a few scattering shipments, or that affect the transportation charge between stations that are not in a principal channel of traffic.

In the 16 months there were 87 complaints on the rates on food-stuffs, 25 of these involving rates on grain and grain products. Of these 26 were decided in favor of the complainants, 23 were dismissed, withdrawn or indefinitely postponed, five were adjusted or compromised, and 33 had not been decided.

Cotton, the great staple of the South, produces but two complaints. Lumber is really the only article of commerce upon which the rates of freight are in turmoil, the rapidly changing sources of supply necessitating a continual readjustment of freight rates.

Summing up, Mr. McPherson showed that of 425 formal complaints affecting freight transportation, 86 were decided in favor of the complainants, 115 were dismissed, withdrawn or indefinitely postponed, 40 were adjusted or compromised and withdrawn, while 184 remained undecided on April 11.

"When the total number of complaints made during these 16 months," said the speaker, "is compared with the total transactions between the shippers and the railroads of the United States, with the volume and variety of the traffic movement, their number and their importance dwindle into insignificance."

Three-Cent Street-Car Fare in Cleveland.

Since Monday, April 28, all the street railway lines in Cleveland have been operated by the Municipal Traction Company, a company formed in pursuance of Mayor Johnson's plan for providing 3-cent fares throughout the city, which plan, after a controversy extending over seven years, has now been put into effect. At a meeting on April 27, the city council agreed with the different owning companies on the terms of a consolidation, and the "Cleveland Railway Company" was incorporated as a holding company. This company is the owner of the properties, which are leased to the Municipal Traction Company for 50 years. The total valuation of the property of the four companies which are included in the arrangement is \$23,690,000; and it is proposed to make extensions and betterments aggregating about \$11,310,000. All existing franchises were abandoned by the old companies. On Tuesday, April 28, by way of celebrating the "victory" of the people, all passengers were carried free throughout the city. Since Tuesday the uniform fare has been 3 cents. On Wednesday the 1,850 conductors and motormen employed on the lines presented a demand for an increase in their pay of 2 cents an hour, which, it is said, had been promised them by the old companies, and the newspapers talked of an impending strike; but after three or four days' discussion it was decided to submit all questions to arbitration. The people of East Cleveland have already entered a complaint in the courts because the new low rate does not extend into the village.

The Westinghouse Mill Motor.

The mill type direct-current motor, which has recently been put on the market by the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., is designed to meet the severe conditions of service in steel mills. It is also adapted to such railroad work as operating transfer tables and bending rolls in the boiler shop. The motor used on the transfer table may be provided with two friction clutches, one of which operates the drum for pulling cars or dead engines on to the table, and the other the mechanism which drives the table. As it is possible to disconnect both clutches at once, there may be times when there is no load on the motor. An ordinary series motor relieved of all load would run at a dangerous speed; this motor has a shunt field connection, which limits the no load speed to approximately double the full load speed.

The motor frame is divided horizontally and is hinged so that the upper half can be quickly swung back for repairs. The frame is so heavy as to minimize vibration. The frame is provided with handholes for inspection of the commutator and windings, but the covers fit tightly and the frame and bearing housing are dustproof.

The shaft is large, with keyways of liberal dimensions. The bearings have large wearing surface and the air gap between the fields and the armature is large, so that there may be considerable wear in the bearings before the revolving and stationary parts could rub. The bearings are split and made interchangeable for either end of the motor. No dowel pins are used, as lugs cast with the bearings are used to keep them from turning. An eyebolt on each bearing makes handling the armature convenient. Only asbestos, mica, porcelain and an insulating compound are used for insulating. The coils are treated with the compound and then baked at a temperature far higher than any that will ever be met in actual service. The armatures are wound with strap copper insulated with mica tape, handwound. This form of coil can be easily repaired by the

customer. The coils are held in place by hard fiber wedges and bands which are below the surface of the laminations.

Automatic Carline Grain Door Hook.

An automatic carline hook for grain doors, recently brought out by the Chicago Grain Door Co., Chicago, is illustrated herewith. This company has used for many years a malleable iron hook for holding the grain door in raised position against the carline, which was satisfactory for cars which were not too high for a man to reach the hook. But with present large capacity cars, where the roof is above the reach of the tallest man, the hook has to be worked

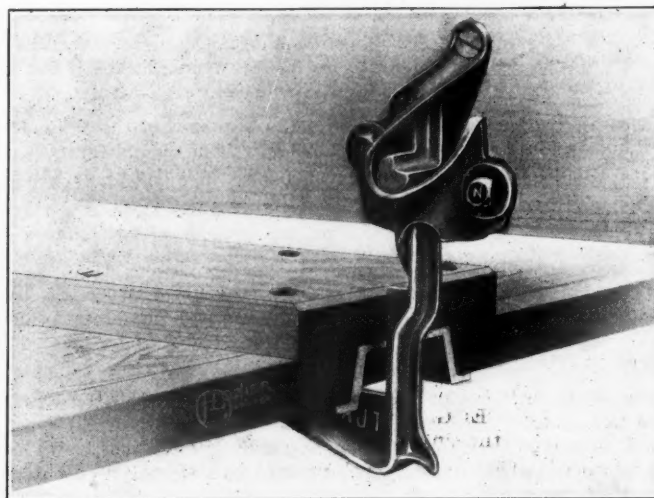


Fig. 1.

with a bar or stick. To meet this condition the fixture here shown was designed and patented. It works automatically, both in putting up grain doors in high box cars and taking them down from the roof when needed to load grain or other bulk cargoes. It is claimed that the hook is a positive lock when the door is folded up in the roof of the car, and the door cannot possibly fall down until released as described below.

To fold the grain door up in the roof of the car, raise it vertically until the swivels are on the top ledges of the rods, pull the bottom of the door inwardly to a horizontal position, then, with a

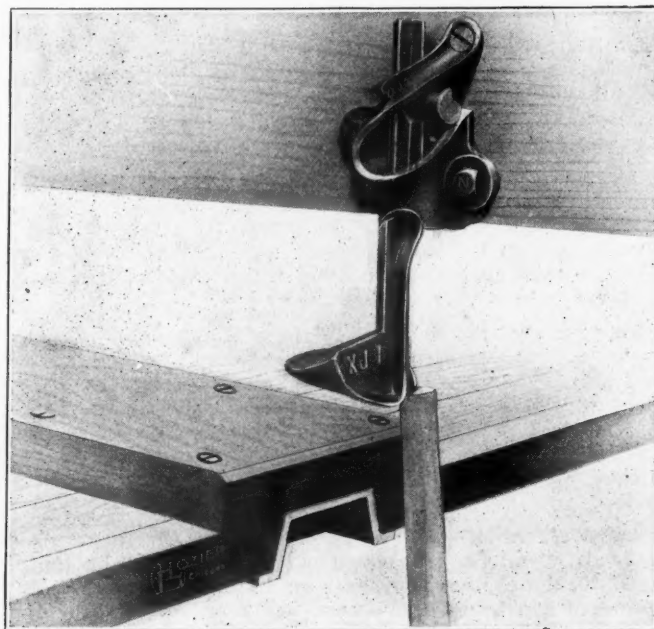


Fig. 2.

bar or stick, push the door upward against the hook XJ1, which will automatically raise, making a quarter turn to the left, pass by the door and immediately drop downward (by gravity and the slide) to its former position, under the grain door (Fig. 1). The door is positively locked between the hook and the slide plate of the box car and cannot possibly change its position until the hook is moved to release it. To take the door down (Fig. 2), use a bar or stick 3 ft. or more long, push upward on the bottom of the hook (or the small projection at the back of same) raising the grain door with the hook. The hook will make a quarter turn to the left, release the door and then, by gravity and the slide, drop to place and former position automatically.

A Southern Impression of the Railroad Situation.

The story, apocryphal but illustrative, is told of a visitor who desired to see the president of an important southern railroad. He called at the office and was told that the president was in Washington appearing before the Interstate Commerce Commission. He asked for the vice-president, and was informed that he was in Georgia attending a legislative conference. The general manager was reported as in Alabama, summoned there by the legislative conditions which threatened ruin to the railroads of that state. The passenger agent was in North Carolina pointing out to the Legislature the injury which would surely follow the enactment of its bill for lower passenger rates. Finally, in despair, the visitor asked for the highest official in authority, and the office boy told him that he was trying to run the railroad while all of the officials were trying to save it from destruction by legislation. That very nearly states the case.

What of the future? With the physical condition of railroads deteriorating because of their inability to find money to make improvements so long as anti-railroad legislation continues, we are facing what is probably the most critical period in the history of American railroads.

Of recent years the public seems to have come to the conclusion that men with bulging bank accounts are eagerly waiting for an opportunity to put money into railroad securities, though the control of the railroads is taken from them, and though other people who have no financial interest in them are given authority to fix the rates at which they can do business. The idea is fallacious. The capital needed for railroad expansion is not going to seek railroad investment, but railroad men must seek the capital with diligence. They must be able to present the matter in such a way as to indicate profits large enough to justify the risk, or otherwise those who have the bulging bank accounts will keep their money themselves or else put it in securities over which they do have some control. Are the people in public and private life who are fighting railroads or demanding impossible improvements willing to invest their own money in railroad securities at present? Not one of them. As a field for investment the railroad is no longer an attractive proposition, and this, too, comes at a time when never in our history did we need so much money for railroad expansion. We ought within the next five or ten years to put more than one-half as much money into the enlargement of railroad facilities as the total amount now represented in all the stocks and bonds of the railroads of the country. Where is so vast a sum to come from? If it should not come, then business will be halted, railroad facilities will grow steadily worse instead of better, and the country will suffer as it has suffered for the last few years because the railroads were unequal to the volume of traffic. The country holds its hands up in horror, and justly so, at the disastrous railroad wrecks. Under present conditions railroad wrecks are likely to increase rather than to decrease. Railroad wrecks are mainly due to the volume of traffic being in excess of the facilities of the road, to the low physical condition arising from lack of money to make improvements or to the inefficiency of men who have been taught during the last few years to seek to get as much as possible and give as little of faithful work in return as possible. In other words, they have drunk of the deadly poison—get something for nothing—which is now sapping the sturdy self-reliance and independence of so many of the American people. While railroad employees generally are faithful to their trust, some inefficient men, without a sense of their responsibility, have eagerly grasped at this teaching and feel that the railroads and the world at large owe them a living whether they earn it or not. The anti-railroad agitation is largely responsible for this.—Richard H. Edmonds, in the *Manufacturers' Record*.

American Institute of Chemical Engineers.

The committee appointed at Atlantic City last June to consider the formation of an American Institute of Chemical Engineers has found a strong sentiment for bringing together into closer relationship men who specialize in chemical engineering. A decisive vote has been received in favor of the formation of the society. For the purpose of organization, a meeting will be held in Philadelphia about the middle of June.

An Error Corrected.

The statement in the *Railway Age* of April 24, to the effect that Mr. H. H. Sessions had resigned his position as Vice-President of the Standard Coupler Company of New York, was an error. Mr. Sessions' connection with the Standard Coupler Company continues, as it has for many years, his official and personal relations with that company being entirely harmonious and satisfactory. His connection with another company, which conducts a business confined to the repairs of old or bad order cars exclusively, in no way interferes with his duties in the Standard Coupler Company, nor does

it bring him in competition in any way with builders of new car equipment, either freight or passenger.

Manila and Cavité Line Open.

The first passenger train was run on May 2 between Manila and Cavité. Up to the present the only connection between Cavité and Manila was by a sea trip of six miles across the bay. The opening of the line means that stores and men can be quickly moved between these points in all weather.

The University of Colorado Engineering Shops.

On April 25 the new engineering shops of the University of Colorado were formally opened. President James H. Baker gave a short review of the growth of the engineering department from one instructor, one student, one drawing board and no room, in 1893, to the present faculty of 27 members, student enrolment of 271, and the full shop, laboratory, drawing and recitation room equipment.

The shops are 93 ft. x 122 ft., the building being in three sections, with modified saw-tooth roofs. The front section is two stories, the upper part being used by the general engineering drawing department. Below are rooms for wood turning and wood bench work. To the rear are the lathes and other heavy machine tools for working steel and iron. Across the hall are the forge and foundry rooms, equipped with all the appliances required in modern shop practice.

The Retort Courteous.

Street Railway Superintendent—"I don't think we can use you any longer. Your cash register doesn't ring often enough."

Conductor—"I have got rheumatism and can't reach up to the register cord."

Superintendent—"All right. I think you need a long vacation."

Conductor—"I am much obliged to you for allowing me to run the car as long as you have."

Superintendent—"Don't mention it. I'm much obliged to you for bringing the car back."—Judge.

Medals for Bravery.

Upon recommendation of the Interstate Commerce Commission the President has awarded railroad life-saving medals to Frank Larson and Charles Bennett. On January 19 last, at Exeter, Neb., Larson, a fireman on the Chicago & North-Western, distinguished himself by crawling out on to the pilot of his engine and saving the life of a three-year-old child who was in the center of the track, and who but for Larson's heroism would have been run over and killed by the moving train. Bennett was a brakeman, also on the Chicago & North-Western. He rescued a woman who was in imminent danger of being struck by a fast passenger train at Waukegan, Ill.

Tug Boats in Straits of Magellan.

It is reported that a Danish company will establish a line of tugboats to tow vessels through the straits of Magellan. It is estimated that 3,000 sailing vessels under all flags pass around from the Atlantic to the Pacific yearly. It frequently takes weeks to round the Horn, while vessels could ordinarily be towed through the strait in 36 hours. It is proposed to station 10 powerful tugs at Punta Arenas in the straits.

INTERSTATE COMMERCE COMMISSION RULINGS.

Value of Testimony Concerning Past Secret Rates.

Frye & Bruhn et al. v. Northern Pacific and Chicago, Burlington & Quincy. Opinion by Commissioner Harlan.

The complaint alleged that the rate of \$170 per car for the transportation of live hogs in 36-ft. single-deck cars from Missouri river, St. Paul and points intermediate to Seattle is unreasonable; that from branch-line stations west of the Missouri river the local rate to main line junctions is added to the \$170 rate, making an unreasonable combination through rate; and that defendants unlawfully fail and refuse to publish rates for the transportation of live hogs in double-deck cars. The Commission held that the \$170 rate is not shown to be unreasonable; that there is not sufficient evidence in the record to warrant a finding that the combination rate applied on shipments from branch-line stations is excessive,

but it seems that the local rate on the branch line ought to be absorbed; that the record does not justify requiring defendants to furnish double-deck cars and re-establish double-deck carload rates; and that claim for reparation must be disallowed, except on certain 10 carloads shipped in 1904 under an excessive rate of \$240 per single-deck car.

The Commission holds that evidence of rebates allowed in the past when offered by a shipper who unlawfully received them is not competent to show that the published rate is unreasonable.

The fact that defendants accepted, and complainant actually paid, less than the published rates, in violation and in defiance of law, raises no presumption that the published rate is unreasonable, but tends rather to raise a presumption that the defendants somewhere in their rate structure exacted from shippers of other commodities rates that were unreasonably high.

TRADE CATALOGUES.

Corrugated Steel Bars.—The 1908 catalogue of the Expanded Metal & Corrugated Bar Co., St. Louis, Mo., is a 112-page book, 8 in. x 10 in. Besides the regular squares and flats, it gives sizes and weights of the new round bars, just being placed on the market. The contents are subdivided into Building Construction, Foundations, Railroad Structures and Miscellaneous Structures. In each division, there are numerous photographs of reinforced concrete structures using corrugated bars. At the back of the book is a chapter on the strength of reinforced concrete beams, including a lot of tables for use in designing such beams.

Bolsters.—The Pittsburgh Equipment Co., Pittsburgh, Pa., has published a portfolio of blueprints, showing perspective views of different styles of truck and body bolsters, including draft carriers suited to different draft gears, combined cast steel and pressed steel underframes, cast steel end sills, cast steel side frames, spring planks and oil boxes.

Large Steam Engine Tests.—Bulletin No. 1,502 of the Allis-Chalmers Co., Milwaukee, Wis., describes tests of the steam engines furnishing power for the Interborough subway in New York. They are rated at 8,000 h.p., but the actual capacity is 12,000 h.p. The bulletin gives full details and information regarding the tests.

The Union Pacific passenger department is distributing a folder entitled "Homes in the West." It tells of free government lands in western Nebraska and in the South Platte valley, Colorado, and of the resources, climatic conditions and agricultural opportunities. It also explains how the government lands may be obtained.

Air Compressors.—The National Brake & Electric Co., Milwaukee, Wis., is distributing a card showing a halftone view of a single-step motor-driven, type 3 V S, three-cylinder air compressor. These are built in capacities from 50 to 225 cu. ft. of free air per minute.

MANUFACTURING AND BUSINESS.

A. L. Whipple has been appointed Sales Manager for Forsyth Brothers Co., Chicago, with headquarters in New York.

The offices of the American Steel Foundries, New York, have been removed to the Hudson Terminal buildings, 30 Church street.

The New York office of the Ajax Manufacturing Co., Cleveland, Ohio, has been moved to the Hudson Terminal buildings, 50 Church street.

The New York office of The Railway Materials Co., Chicago, has been moved to the new Singer building, Broadway and Liberty street.

The district office at San Francisco, Cal., of the Allis-Chalmers Co., Milwaukee, Wis., has been moved to the Phillips building, 599 Mission street.

Walter H. Baldwin, for eleven years Chicago Sales Manager of the Lidgerwood Manufacturing Co., New York, has been made Assistant General Manager of The Adams & Westlake Co., Chicago.

The Imperial Steel Works, operated by the Japanese Government, recently placed their orders for vise equipment, consisting entirely of double swivel vises, with the Pittsburgh Automatic Vise & Tool Co., Pittsburgh, Pa.

H. G. Perring, Secretary of the Engineers Club of Philadelphia, Pa., and formerly engineer with the Keystone Fireproofing Co., has gone to the General Fireproofing Co., Youngstown, Ohio, as District Manager at Philadelphia, with offices in the Drexel building.

W. R. Burrows, formerly Purchasing Agent of the Norfolk & Southern, has taken charge of the railroad department of Topping Brothers, 122 Chambers street, New York, manufacturers of ball

bearing jacks, track drills, tool grinders and Totten's brake beam clamp.

The General Railway Supply Co., 922-23 Marquette building, Chicago, is agent for the metallic sheathing, "National" steel trapdoors, "Schroyer" friction curtain rollers and "National" standard roofing, recent orders for which were noted in this column two weeks ago. An error in printing made the name read General Railway Specialty Co.

C. H. Spotts, for some ten years manager of the paint department of the Joseph Dixon Crucible Co., Jersey City, N. J., has resigned. Mr. Spotts has made no definite plans for the future, but has in mind identifying himself with building a new plant in the vicinity of New York for making paints especially adapted to railroad use. Mr. Spotts' address is in care of Engineers' Club, 32 West Fortieth street, New York.

W. G. Smith, Dr. Edwin Lodge and Herbert E. Boynton have resigned as Directors of the New York Car Wheel Co., Buffalo, N. Y., and are succeeded by Frederick L. Colby, Oscar C. Shimmel and Herbert E. Payne. Bernard Ginsburg has been elected Vice-President, succeeding W. G. Smith, resigned, and Edward W. Pendleton has been elected Secretary, succeeding J. A. Venable, who is now Treasurer and General Manager.

Paul R. Brooks has been appointed General Manager of the Machine Sales Co., 68 William street, New York. After leaving the Chicago, Burlington & Quincy, Mr. Brooks represented the Quincy, Manchester, Sargent Co., Chicago, and later went to The Otto Gas Engine Works, Chicago. The Machine Sales Co. has a plant at Peabody, Mass., and builds presses, machine tools, commercial automobiles and special machinery complete, on contract.

The Goldschmidt Thermit Co., New York, has established a branch office and works at 103 Richmond street west, Toronto, Ont., under the management of E. C. Rutherford. Mr. Rutherford is a Canadian by birth, and has been for several years Manager of the Magann Air Brake Co., Ltd., Toronto, and also of the Canadian Brake & Supply Co. A complete stock of Thermit and appliances will at all times be carried at Toronto, and a fully equipped repair shop will be in operation for the repair of steel castings up to 1,000 lbs. in weight.

Robert W. Hunt & Co., Chicago, have established an analytical chemical laboratory in connection with their St. Louis office, 1445 Syndicate Trust building. In addition to general analytical work, particular attention will be given to analyses of and advice on iron foundry mixtures. This work and the laboratory will be under the direction of J. B. Emerson, who for several years past has had charge of the metallurgical part of the wheel foundry of the Mt. Vernon Car Manufacturing Co., Mt. Vernon, Ill., and previously was in the employ of the Illinois Steel Co., Chicago.

The Technical Publicity Association at its annual meeting, April 30, 1908, elected the following officers to serve during the ensuing year: President, C. S. Redfield, advertising manager Yale & Towne Manufacturing Co., New York; First Vice-President, Rodman Gilder, publicity manager Crocker-Wheeler Co., Ampere, N. J.; Second Vice-President, C. N. Manfred, manager advertising department, H. W. Johns-Manville Co., New York; Secretary, H. H. Kress, publicity department, A. S. Cameron Steam Pump Works, New York; Treasurer, H. M. Davis, advertising manager Sprague Electric Co., New York; Members of Executive Committee, F. H. Gale, in charge of advertising, General Electric Co., Schenectady, N. Y., and C. W. Beaver, special representative Yale & Towne Manufacturing Co. Twenty new members have joined the association since the last annual meeting.

Iron and Steel.

Bids for structural steel and iron for the first section of the Fourth avenue subway, in Brooklyn, were received on May 8.

The Maine Central has ordered 6,000 tons of rails from the Lackawanna Steel Co. An Australian road is in the market for 4,300 tons of rails.

OBITUARY NOTICES.

Frederick W. Huidekoper died at his home in Washington, D. C., on April 30. Mr. Huidekoper was born in 1840 at Meadville, Pa. He graduated from Harvard University in the class of 1862 and in 1877 was elected President of the Chicago & Eastern Illinois; from 1881 to 1882 he was also President of the Evansville & Terre Haute. In 1885 he was elected First Vice-President of the Richmond & Danville, the Richmond & West Point Terminal Railway & Warehouse Co., and the Virginia Midland, all now part of the Southern Railway. He became President of the Pittsburgh, Shen-

ango & Lake Erie, now part of the Bessemer & Lake Erie, in 1889, and later Receiver of the same road. From 1892 to 1894 he was Receiver of the Richmond & Danville, and from 1893 to 1894 also Receiver of the Georgia Pacific and the Charlotte, Columbia & Augusta, now part of the Southern Railway. From May, 1896, to August, 1897, he was President of the Chicago, Peoria & St. Louis.

L. P. Farmer, Commissioner of the passenger department of the Trunk Line Association, died at his home in New York City on May 2. Mr. Farmer was 59 years old. He was born at Ellington, Conn., and entered railroad service in 1863 as a clerk in the treasurer's office of the Bellefontaine Railroad, now part of the Big Four. In 1864 he was transferred to the general ticket office of the same road, and in January, 1868, he was made chief clerk in the general ticket office of the Indianapolis & St. Louis, also now part of the C., C. & St. L. He served this company until 1871, when he became Assistant General Passenger Agent of the Missouri Pacific. In 1877 he was promoted to General Passenger Agent. In 1882 he became New England Passenger Agent for the Pennsylvania and five years later General Passenger Agent of the New York, Lake Erie and Western, now the Erie. On August 1, 1890, he was made Commissioner of the passenger department of the Trunk Line Association.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

International Railway General Foreman's Association.

The fourth annual convention of this association is to be held at the Lexington Hotel, Chicago, beginning May 25.

Franklin Institute.

At a section meeting of the Institute, May 7, there was an address on "The Construction of the Walnut Lane Bridge," by Moriz Bernstein, Philadelphia, Pa., illustrated by lantern slides.

New York Railroad Club.

At the next regular meeting of this club to be held May 15, a paper on "Reinforced Concrete, with Special Regard to Its Use in Railroad Work," by Alexander Crawford Chenoweth, will be presented.

American Society of Civil Engineers.

At a regular meeting of this society May 6 a paper on "Sub-structure of Piscataquis Bridge and Analysis of Concrete Work," by G. A. Hersey, was presented for discussion. This paper was printed in "Proceedings" for March, 1908.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Atchison, Topeka & Santa Fe.—Paul Morton has been elected a Director and a member of the Executive Committee. Mr. Morton was Second Vice-President of the Atchison in 1905, when he was appointed Secretary of the Navy. He is now President of the Equitable Life Assurance Society.

Beaumont, Sour Lake & Western.—R. C. Duff, President, has resigned. It is announced that A. J. Davidson, President of the St. Louis & San Francisco, is to be elected President in Mr. Duff's place. Mr. Duff has been connected with the B., S. L. & W. since 1903, when it was incorporated. For two years he was one of its general attorneys and in 1905 he was made President. He has not as yet made any announcement of his plans for the future.

See Colorado Southern, New Orleans & Pacific.

Colorado Southern, New Orleans & Pacific.—J. W. McCullough has been appointed Auditor of this company, and of the Beaumont, Sour Lake & Western, succeeding H. M. Hood, with office at Beaumont, Texas.

Delaware, Lackawanna & Western.—A. D. Chambers, Assistant Treasurer, has been appointed Secretary and Treasurer, succeeding the late F. F. Chambers. R. F. Schofield succeeds A. D. Chambers.

Missouri Pacific.—Stuyvesant Fish, formerly President of the Illinois Central, resigned as director of the Missouri Pacific on May 2.

New York Public Service Commission.—John Barstow Olmsted, of Buffalo, N. Y., who has been appointed to the Commission for



John B. Olmsted.

the Buffalo Civil Service Reform Association. He is an ex-member of the Civil Service Commission for the city of Buffalo, is President of the Twenty-third Ward Good Government Club, and President of the Buffalo Municipal League. He was Dean of the Saturn Club in 1898 and 1899, President of the Liberal Club in 1900 and 1901, President of the Harvard Association of Western New York in 1901, and Vice-President of the Buffalo Municipal League in 1905. He is a Trustee of the Elmwood School and the Buffalo Seminary and a member of the council of the University of Buffalo.

Operating Officers.

Chicago & Alton.—C. F. Smith, Trainmaster at Dwight, Ill., has been appointed to the new office of Inspector of Transportation, with headquarters at Bloomington, Ill.

Chicago, Milwaukee & St. Paul.—J. T. Gillick, Superintendent of the Chicago & Milwaukee division, has been appointed Superintendent of Terminals at Chicago, succeeding P. C. Hart. L. R. Clausen, Superintendent of the Prairie du Chien and Mineral Point divisions, succeeds Mr. Gillick, with office at Chicago. F. H. Myers, Assistant Superintendent of Terminals at Chicago, succeeds Mr. Clausen, with office at Milwaukee, Wis. P. L. Rupp, Trainmaster at Minneapolis, Minn., succeeds Mr. Myers.

Mr. Clausen is 31 years old, having been born in October, 1877. He is a graduate of the University of Wisconsin, class of 1897, in electrical engineering, and entered railroad service in 1899 as baggageman on the C., M. & St. P. A year later he was put in charge of the maintenance of storage batteries and electric lighting equipment at the Chicago passenger yards. At the end of eight months he left railroad service and went to the Pacific coast, but soon returned to the C., M. & St. P. as a signal inspector. In September, 1903, he succeeded W. H. Elliott as Signal Engineer. Last November he was promoted to Superintendent of the Prairie du Chien and Mineral Point divisions, from which he is now advanced to the Chicago & Milwaukee division. Mr. Clausen is Vice-President of the Railway Signal Association.

Chicago, Rock Island & Pacific.—The position of Trainmaster of Omaha terminals has been abolished, and the territory of A. B. Ramsdell, heretofore Trainmaster at Des Moines, Iowa, has been extended to include Council Bluffs, Iowa, and Albright, Neb. Mr. Ramsdell's headquarters have moved to Council Bluffs.

Delaware, Lackawanna & Western.—Frank Cizek, Trainmaster of the Morris and Essex division, has been promoted to Superintendent of the Bangor and Portland division, a new office, with headquarters at Easton, Pa.

Illinois Central.—C. B. Fletcher, Superintendent of the Cherokee division, has been appointed also Superintendent of the Omaha division, his office remaining at Cherokee, Iowa.

Missouri Pacific.—H. G. Clark has been appointed Superintendent of the Colorado division, with headquarters at Pueblo, Colo. J. E. Snedeker, Superintendent of the Southern Kansas division, has been appointed Superintendent of the Central Kansas division, with headquarters at Osawatimie, Kan., succeeding J. F. Simms, transferred. P. A. Buck, Superintendent at Chester, Ill., succeeds Mr. Snedeker, with office at Coffeyville, Kan. W. E. Merrifield, Trainmaster of the Northern Kansas

division, has been appointed Superintendent of the Illinois division, with headquarters at Chester, Ill. D. H. Robinson, Trainmaster at Nevada, Mo., succeeds Mr. Merrifield, with office at Atchison, Kan.

New York Central & Hudson River.—Seth R. Payne, Superintendent of the Buffalo division, has been appointed General Superintendent of the Western district, with office at Syracuse, N. Y., succeeding L. H. Van Allen, resigned. Isaac H. McEwen, Assistant Superintendent of the Mohawk division, succeeds Mr. Payne, with office at Buffalo, N. Y.

Seaboard Air Line.—H. C. Grimshaw, Superintendent of the Fifth division, will move his office from Americus, Ga., to Savannah, on May 10. J. B. Glazier, Superintendent of Terminals at Savannah, has been appointed Trainmaster at that place, effective the same date, and the office of Superintendent of Terminals at Savannah has been abolished.

Southern Railway.—R. W. Hunt, Assistant General Passenger Agent at Atlanta, Ga., has been transferred to the auditing department and appointed Superintendent of Train Collectors. J. L. Meek, division passenger agent at Knoxville, Tenn., succeeds Mr. Hunt.

Traffic Officers.

Illinois Central.—E. K. Bryan, Acting Assistant General Freight Agent, has been appointed Assistant General Freight Agent, succeeding John Dwyer, who resigned to engage in other business.

Kalamazoo, Lake Shore & Chicago.—F. L. Comstock has been appointed General Freight Agent, with office at South Haven, Mich.

Lake Shore & Michigan Southern.—W. F. Carter, traveling passenger agent at Toledo, Ohio, has been appointed General Agent, passenger department at Toledo.

Missouri Pacific.—L. D. Knowles has been appointed General Agent at Denver, Colo., succeeding M. C. Post, resigned.

Philadelphia & Reading.—J. F. Auch, Assistant General Freight Agent, has been appointed General Freight Agent, with office at Philadelphia, Pa., succeeding B. H. Bail, who was made Freight Traffic Manager.

San Antonio & Aransas Pass.—J. B. Brooks, General Agent at San Antonio, Tex., has been appointed Assistant General Freight Agent, with office at the same place.

Southern Railway.—See this company under Operating Officers.

Engineering and Rolling Stock Officers.

Boston & Albany.—Everett E. Stone has been promoted from Engineer of Maintenance of Way and Structures to Chief Engineer, with headquarters at South Terminal Station, Boston, Mass. Mr. Stone was born at Leicester, Mass., in 1865, and graduated from Worcester Academy in 1885. He entered the service of the Boston & Albany two years later as a surveyor. The next year he was made assistant roadmaster, and in 1890 was promoted to roadmaster. He held this position for four years and was then appointed Assistant Chief Engineer, in which position he served until 1907, when he was appointed Engineer of Maintenance of Way and Construction. He began his duties as Chief Engineer on May 1 of the present year. Mr. Stone was for two years Mayor of Springfield, Mass., having before that been for five years President of the Common Council.



E. E. Stone.

Illinois Central.—W. Renshaw, Superintendent of Machinery, has resigned. J. G. Neuffer, Assistant Superintendent of Machinery, succeeds Mr. Renshaw.

Peoria & Pekin Union.—Stanley Millard, Chief Engineer, has resigned. Walter E. Emery, formerly Engineer of Maintenance of Way of the Chicago & Alton at Kansas City, Kan., succeeds Mr. Millard.

LOCOMOTIVE BUILDING.

The Chicago & Alton has ordered five locomotives from the Baldwin Locomotive Works.

The Chicago, Milwaukee & St. Paul, as mentioned in the *Railroad Gazette* of May 1, has ordered 50 locomotives from the American Locomotive Company.

The Delaware, Lackawanna & Western, as mentioned in the *Railroad Gazette* of May 1, has ordered from the American Locomotive Company eight hard coal ten-wheel passenger locomotives, five hard coal six-wheel switch engines, 15 soft coal six-wheel switch engines, 14 soft coal consolidation engines, five soft coal Mogul freight engines and two soft coal Mogul pusher engines.

CAR BUILDING.

The Washington Railway & Electric Co., Washington, D. C., is in the market for one interurban car.

The Salt Lake & Mercur has ordered one combination passenger and baggage car from the American Car & Foundry Company.

The Minneapolis & St. Louis has ordered two combination baggage and mail cars from the American Car & Foundry Company.

The Diamond State Rapid Transit Co., Smyrna, Del., it is said, will buy a number of interurban cars. This item is not yet confirmed.

The Brownsville, Masontown & Smithville Street Railway, McKeesport, Pa., under construction, W. J. Shelden, President, expects to ask bids on cars in about 30 days.

The Northern Pacific has ordered from the American Car & Foundry Company 10 combination mail and baggage cars, 10 combination passenger and baggage cars and 10 combination baggage and express cars. It is expected that an order for more passenger cars for use on new lines in the northwest will be placed within a month.

RAILROAD STRUCTURES.

ABILENE, TEXAS.—The Texas Railroad Commission has ordered the Texas & Pacific to put up new stations at Abilene, Lambert, Dothan and Judkins.

BLOOMINGTON, ILL.—The shops of the Chicago & Alton were recently destroyed by fire; loss \$50,000.

CHIHUAHUA, MEX.—W. W. Colpitts, assistant chief engineer of the Kansas City, Mexico & Orient, is in charge of the work on the 850-ft. steel bridge now being built over the Conchas river, about 85 miles east of Chihuahua. Six of the concrete piers are finished and 12 more are to be built.

EVANSTON, WYO.—The Union Pacific, it is said, is arranging to make improvements here including a 43-stall roundhouse, and enlarging the present shops, at a cost of \$250,000.

NEW ORLEANS, LA.—The New Orleans Terminal Company expects to open the new Union Passenger Station about June 1.

NEW WESTMINSTER, B. C.—Mayor Keary is quoted as saying that the Dominion Government will spend \$2,000,000 for harbor and dock improvements here.

RANDALL, OHIO.—The Erie, it is said, has started work on a new ore trestle to be 2,800 ft. long, and to have a capacity of 250,000 tons. The cost of the improvement is to be about \$60,000.

SPIRIT LAKE, IDAHO.—Contract is reported let to Westinghouse, Church, Kerr & Co., of New York, at about \$200,000, for putting up brick shops, also a nine-stall roundhouse here, for the Idaho & Washington Northern. Work is to be started this month.

WESTPOINT, OHIO.—The Youngstown & Ohio River Railroad, it is said, is putting up a power house here to cost \$285,000.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ABERDEEN & TOMBIGBEE VALLEY.—Building from Okolona, Miss., southeast to Pickensville, Ala., 65 miles. Grading finished on 32 miles. President Reynolds announces that the entire line is to be in operation by Jan. 1, 1909. W. T. McKee, Chief Engineer, Aberdeen, Miss. (March 27, p. 461.)

ARKANSAS, LOUISIANA & GULF.—Announcement is made that this company has opened its line for freight traffic from Monroe, La., north to Bastrop, 23½ miles. (March 13, p. 389.)

ATLANTIC, QUEBEC & WESTERN.—J. X. Lavoie, Second Vice-President, is quoted as saying that this company has built 20 miles on the extension toward Gaspé, and that an additional 80 miles is under contract. About 850 men are at work, and this num-

ber is to be at once increased. The work includes piercing a tunnel at Cap l'Enfer, 850 ft. through limestone rock. This is expected to be finished in June. It is expected to have the entire work finished through to Gaspé in the latter part of 1909. There are to be 26 concrete and steel bridges on the lower section. Terminal arrangements are being made at Gaspé. The passenger station is to be at the foot of Fort Ramsey, and the freight terminal at Sandy Beach, about four miles from the town, where there are good port facilities. (March 13, p. 395.)

ATLANTA & ST. ANDREWS BAY.—This company has started operation on the extension of its road from Fountain, Fla., south to Youngstown, eight miles.

BESSEMER & LAKE ERIE.—The Western Allegheny, affiliated with the Great Lakes Coal Company, it is said, has finished connections with the Baltimore & Ohio at New Castle, Pa.

Bids, it is said, will shortly be asked for building the extension from Kaylor, Pa., northeast to Reidsburg, where connection is to be made with the projected Franklin & Clearfield line of the Lake Shore & Michigan Southern. (March 13, p. 390.)

BINGHAM CENTRAL.—Organized to build an ore line from Salt Lake City, Utah, south to Bingham, 10 miles. The company has given a mortgage to carry out the work. There will be a long tunnel. A. C. Ellis, Jr., President, Salt Lake City.

CANADIAN NORTHERN.—Contract is reported let by this company to James Cowan for work on about 18 miles of line on the Rossburn branch.

CANADIAN NORTHERN ONTARIO.—See this company under Railroad Corporation News.

CANADIAN PACIFIC.—An officer writes that the contract for building the new line from Lethbridge, Alb., west to McCloud has been let to Janse & McDonald, of McLeod. The work includes two bridges, one over the Belly river, 5,327 ft. long, and the other over the Old Man river, 1,890 ft. long. (April 3, p. 492.)

It is said that this company will spend \$125,000 improving the Esquimalt & Nanaimo.

CANADIAN ROADS.—According to reports from Fernie, B. C., arrangements are being made by D. C. Corbin to build a line from the Crows Nest Pass branch of the Canadian Pacific, to coal mines near McGillivrey, B. C., about 14 miles. It is expected to have the line in operation this summer. Address George Butler, Chief Engineer, Spokane, Wash.

CANANEA, YAQUI RIVER & PACIFIC.—See Southern Pacific.

CHAMPLAIN & SANFORD.—Incorporated in New York with \$600,000 capital to build a line from Addison Junction, N. Y., northwest to Sanford Hill, on the east shore of Sanford lake, about 35 miles. The directors include C. M. Hyatt, J. M. Thompson, L. R. Parker, G. D. Hills, A. B. Jones, and MacNaughton Miller, all of Albany.

COLORADO ROADS.—Preliminary surveys, it is said, have been made, and construction work is to be started in July on a line, to be operated either by steam or electricity, from Ouray, Colo., northwest via Montrose and Olathe to Delta, 60 miles. J. Carmen Layton and B. A. Lockwood, of Des Moines, Iowa, are promoting the project.

EASTERN BRITISH COLUMBIA.—Incorporated with \$750,000 capital, in Canada, to build a line from the south fork of Michel Creek, B. C., on the Crows' Nest branch of the Canadian Pacific, south 14 miles. Also to build branch lines. The provincial directors include D. C. Corbin, A. T. Herrick, J. A. Harvey and J. K. Osherwood.

EL RENO, RED RIVER & PACIFIC.—Incorporated in Oklahoma with \$5,000,000 capital to build 145 miles of railroad from El Reno, Okla., southwest through Caddo, Washita, Kiowa and Jackson counties. The incorporators include H. C. Bradford, G. G. Lewis, L. B. Pennell, F. E. Gillette and M. D. Libby, all of El Reno.

ESQUIMALT & NANAIMO.—See Canadian Pacific.

EVANSVILLE TERMINAL RAILWAY.—This company is offering \$200,000 of bonds to secure funds to build a line from Evansville, Ind., east to Newburg, nine miles. It is proposed to use both steam and electric motive power. The company expects to lease the property of the Evansville & Eastern Electric Railway, operating a line from Newburg east to Rockport, 21 miles, and to operate the lines as one system, together with the line west to Mount Vernon, Ind., a total of 48 miles.

GEORGIA & FLORIDA.—Sub-contracts are reported recently let for work on a connecting link from Nashville, Ga., south to Valdosta, 30 miles. Grading on this section is expected to be finished by the middle of July. This is part of the work intended to include about 150 miles of connecting links between existing lines to complete a through line from Augusta, Ga., south to Madison, Fla. A new line, it is also said, is being built from Willachoochee south to Nashville, which will shorten the line about three miles. (March 13, p. 391.)

GRAND TRUNK PACIFIC.—W. C. Chambers, of Harrison, Ont., it is said, has been given a contract for building 75 miles of railroad for this company near Lake Nepigon.

GRAND VALLEY (ELECTRIC).—This company now operates 21½ miles of electric line connecting Brantford, Ont.; Paris, Glen Morris and Gault. It is said that the present rails will be replaced with 80-lb. sections. (April 24, p. 591.)

KANSAS CITY, MEXICO & ORIENT.—It is said that the Government of Mexico has offered this company a subsidy of \$600,000 in bonds of the state of Chihuahua, Mex., for building its line through this state.

LOS ANGELES HARBOR COMPANY.—See Los Angeles Harbor Railroad Co.

LOS ANGELES HARBOR RAILROAD COMPANY.—An officer writes that the Los Angeles Harbor Company and the Los Angeles Harbor Railroad Co. are being organized, the former to retain a controlling interest in the railroad company. A charter has been granted in California, but no physical work has yet been undertaken. Application has been made to the cities of Los Angeles and Wilmington for franchises. The Harbor Company owns water frontage at the west basin of Wilmington with sufficient land adjoining for terminals. The purpose of the company is to develop the big west basin, dredging and building docks and wharfs, and to establish a trading company, operating ships on the west coast as far south as Panama. The Los Angeles Harbor Railroad is intended as an annex to the harbor enterprise and an outlet to the city of Los Angeles, also as a terminal line for other roads which may build into Los Angeles. It will be about 20 miles long, and will be located about half-way between the Pacific Electric Railway Company's line and the Los Angeles Interurban Line from Los Angeles south to San Pedro. The officers of both companies are: A. C. Bird, President; F. C. Winthrope, Secretary; J. W. Oakley, Treasurer, and A. H. Koebig, Consulting Engineer, Security Building, Los Angeles. (March 27, p. 461.)

MOUNTAIN HOME & WHITE RIVER.—Rights of way have been secured and options taken on a large tract of timber land by this company. It is proposed to build a line from Mountain Home, in Baxter county, Ark., south 10 miles to a connection with the St. Louis, Iron Mountain & Southern. W. L. Marshall, Mountain Home, is the principal promoter.

NASHVILLE & HUNTSVILLE.—According to reports from Huntsville, Ala., this company has given a contract to the American Construction Co. (I. L. McCord, President), to build the first section of its proposed line from Nashville, Tenn., south to Huntsville, 105 miles. The line is projected south to Birmingham, an additional hundred miles. The project is thought to be backed by Illinois Central interests.

NEW YORK CENTRAL & HUDSON RIVER.—According to a statement made by George W. Kittredge, Chief Engineer, before the Public Service Commission at Albany this company contemplates the following important improvements: Five million dollars for Garden-ville yards near Buffalo, N. Y.; \$1,326,000 for improvements in Buffalo, including grade crossings; \$150,000 for Depew shops; \$1,000,000 for grading and repairs to West Shore Railroad; \$75,000 improvements to service at Fairport; \$150,000 improvements at Syracuse; \$400,000 improvements at Dewitt; \$150,000 improvements at Oswego; \$3,500,000 improvements at Utica, including grade crossings, yards and stations; \$200,000, Little Falls; \$500,000, West Albany; \$300,000 improvement in the signal system.

NEW YORK SUBWAYS.—The New York Public Service Commission, First district, will open bids May 8 for the construction of the Fourth avenue subway in Brooklyn. The contractor will have two years from the date of the delivery of the contract to complete the work. (April 3, p. 493.)

OCEAN SHORE (ELECTRIC).—This road has been extended from Pedro Valley, Cal., to Farallone, 5½ miles.

OHIO ELECTRIC.—The city of Bellefontaine, Ohio, has extended an old franchise for 25 years, and this company can now extend into Bellefontaine the line building from Lima, southeast, and which is finished to within three miles of Bellefontaine. It is expected to have cars in operation on the new line in June.

OHIO RIVER & NORTHERN.—Grading, it is said, is under way at Midland, Pa., on a line projected from that place west through East Liverpool, Ohio, and Wellsville, thence north via Westpoint to Lisbon, where connection is to be made with the Erie. Franchises have been granted at East Liverpool and at Wellsville. (Sept. 13, p. 307.)

OKLAHOMA-EL RENO INTERURBAN.—An officer writes that preliminary surveys have been made and work is to be started about July 1 on this projected line from Oklahoma City west to El Reno, 24.5 miles. H. M. Hyatt, Kansas City, Mo., may be addressed,

ORANGE & NORTHWESTERN.—See St. Louis & San Francisco.

PACIFIC & SOUTHEASTERN.—Organized with a capital of \$15,000,000 to build a line across the state of Washington, with a western terminus at Tacoma, with branches to Spokane, Seattle and British Columbia. Some surveys are being made, and construction, it is said, will be started this year. The incorporators include Gen. T. V. Hubbard, George Crocker, New York; Charles Lathrop, California; A. D. Shepard, General Manager of the Pacific Improvement Company, of California, and General Ashton, of Tacoma.

PAN-AMERICAN.—J. M. Neeland, Vice-President and General Manager, is quoted as saying that work will be finished to the Guatemalan border this month, and through trains will be put in operation about July 1 from San Geronimo to Ayutala, 285 miles. The line was recently put in operation as far south as Tapachula, about 25 miles from the Guatemalan border.

PENNSYLVANIA LINES WEST.—The rights of the old Canton & East Liverpool project, it is said, have been transferred to this company and preliminary work has already been done. The projected route is from Smith's Ferry, Pa., about eight miles east to East Liverpool, west across Columbiana county, Ohio, to Bayard, about 35 miles, where connection is to be made with the main line of the Cleveland & Pittsburgh.

ST. LOUIS & SAN FRANCISCO.—It is said that the Orange & Northwestern is to be extended from Newton, Tex., north to Hemphill, 40 miles. The line connects with the Colorado Southern, New Orleans & Pacific.

ST. LOUIS, BROWNSVILLE & MEXICO.—Trains are now being run by this company into Houston, Texas, using the freight and passenger stations of the Houston Belt & Terminal Company. (Nov. 1, p. 542.)

SOUTHERN PACIFIC (MEXICO).—Important changes in the concessions held by this company, it is said, have recently been given by the Mexican Government for building the Cananea, Yaqui River & Pacific through the states of Sonora and Sinaloa. The construction of the branch from Tonichi, Sonora, north to the international boundary is to be started as soon as the section from Corral north to Tonichi is finished. Track laid from Corral north to Cumuripa, 41 miles. Grant Brothers Construction Company, of Los Angeles, Cal., contractors. According to the terms of the concession 50 miles must be built annually, and the entire line finished by March, 1914. The line when finished will be 386 miles long. (April 24, p. 591.)

SOUTHWESTERN RAILWAY OF TEXAS.—This company was incorporated last year in Texas to build a line from Henrietta southwest to Graham, about 60 miles. It is said that it now has most of the surveys made and has work under way from Henrietta south. Grading is done for 22 miles and track laid for half that distance. H. J. Bradshaw, General Manager, and W. S. James, Chief Engineer, Henrietta.

TERRE HAUTE, ROBINSON, OLNEY & SOUTHWESTERN.—Incorporated in Illinois with a capital of \$10,000, and office at Robinson. The company proposes to build a line from a point on the Wabash river at the Indiana boundary, southwest through the counties of Crawford, Richland, Wayne, to Mt. Vernon, in Jefferson county, about 100 miles. The incorporators and directors include H. C. Pugh, W. H. Moss, H. T. Taussig, W. H. Cisne, C. S. Wilson, and G. M. Barker.

TEXAS & PACIFIC.—The Texas Railroad Commission, on May 5, ordered improvements on the Texas & Pacific between Fort Worth and Sierra Blanca, a distance of 500 miles, which it is estimated will cost \$2,000,000. This is in addition to the \$2,000,000 previously ordered to be spent for betterments.

UNION INDUSTRIAL.—Incorporated in Oklahoma with \$15,000 capital to build a connecting line between the Chicago, Rock Island & Pacific, and the Kansas City, Mexico & Orient, at Aline, Okla. The incorporators include George W. Graham, W. J. Woodliff, and J. A. Hartshorn, of Aline; H. L. Noah and H. A. Noah, of Alva, Okla.

WASHINGTON, PATUXENT & DRUM POINT.—This company was incorporated last year to build a line from the Chesapeake Beach Railroad along the east side of Patuxent river to Drum Point, Md., about 30 miles. Contracts for the work are to be let next fall. There will be four bridges. Address C. N. Mayer, Washington, D. C.

WESTCHESTER & WILMINGTON (ELECTRIC).—A contract is reported let to the Eastern Railway Construction Company of Delaware for building this proposed line. The contract includes the erection of a power house and the installation and equipment of the entire line. The projected route is from West Chester, Pa., south to Wilmington, Del., 17 miles. There will be two bridges. (March 13, p. 395.)

WESTERN ALLEGHENY.—See Bessemer & Lake Erie.

YOUNGSTOWN & OHIO RIVER (ELECTRIC).—This company is now running cars to Salem, Ohio, and to Lisbon. Grading, it is said,

has been nearly finished on an extension to East Liverpool, and it is expected to have the line finished to the Ohio river this fall. (Sept. 13, p. 308.)

RAILROAD CORPORATION NEWS.

ATCHISON, TOPEKA & SANTA FE.—Moffat & White and Clark, Dodge & Co., of New York, and Lee, Higginson & Co., of Boston, offer the unsold portion of \$4,000,000 general mortgage 4 per cent. bonds of 1895-1895. There is outstanding \$152,155,000 of an authorized issue of \$165,490,500.

CANADIAN NORTHERN ONTARIO.—The government will guarantee an issue of \$2,500,000 40-year 3½ per cent. bonds, of which \$1,000,000 will be issued to build 50 miles of new line at \$20,000 a mile, including a proposed line to the Moose Mountain iron deposits and the Garson mines. The remaining \$1,500,000 is to be issued for terminals in Toronto.

IDAHO NORTHWESTERN.—This property, controlled by the B. R. Lew's Lumber Co., of Coeur d'Alene, Idaho, has gone into the hands of a receiver, together with the lumber company.

MISSOURI, KANSAS & TEXAS.—H. W. Poor & Co., of New York and Boston, offer at 75½ a block of "first and refunding mortgage" 4 per cent. bonds of 1904-2004. There are \$5,182,000 of these bonds outstanding and \$4,797,000 held in the company's treasury. These bonds are a first mortgage on terminals at Kansas City, locomotive shops at Parsons, Kan., and equipment valued at \$18,530,000.

The order of the Texas Railroad Commission, requiring the Missouri, Kansas & Texas to purchase 165 new locomotives and 6,000 freight cars during the years 1908 to 1910, has been indefinitely suspended.

NATIONAL RAILWAYS OF MEXICO.—It is said that the deposit of various classes of securities of the Mexican Central and the National Railroad of Mexico has already reached a point insuring the success of the plan to merge these companies.

NEW YORK, NEW HAVEN & HARTFORD.—It is said that the bonds about to be issued to meet maturing obligations between now and January 1, 1910, consist of Harlem River & Portchester first mortgage bonds and Air Line and Northampton division first mortgage bonds, and in addition there are to be issued \$2,000,000 short term notes. The bonds have been underwritten on a basis of between 4¼ and 4½ per cent., as compared with a 5 per cent. interest rate upon the obligations which they will retire.

PENNSYLVANIA.—A semi-annual dividend of 3 per cent. was declared on May 1, thus reducing the annual rate from 7 per cent., established in November, 1906, to 6 per cent., the rate prevailing from May, 1900 to 1906. This means a present annual saving in dividend charges of a little over \$3,000,000.

Subscribers for the \$40,000,000 4 per cent. bonds offered last week by Kuhn, Loeb & Co. have been allotted only 5 per cent. of their subscriptions.

SOUTHERN RAILWAY.—The Virginia & Southwestern, whose capital stock was purchased by the Southern Railway at \$200 a share, has taken over the Virginia & Southeastern, a projected line, the Houston River railroad, and the Black Mountain railroad. The two latter roads, 40 miles and 30 miles long, respectively, with the Virginia & Southwestern, make about 210 miles of road, with equipment. The Virginia & Southwestern has authorized \$7,000,000 fifty-year 5 per cent. bonds of April 1, 1908-1959. Of these bonds \$2,000,000 will be issued to pay back the Southern Railway for money spent by it on the Black Mountain and the Houston River roads. There will be reserved in the treasury \$3,000,000, and the proceeds from the remaining \$2,000,000 will be used to complete building the Houston River road and to take care of equipment obligations.

UNION PACIFIC.—According to a statement made by E. H. Harriman the financial requirements of the Union Pacific have been much exaggerated. The maximum amount needed at this time to put the company in funds does not exceed \$25,000,000, but the company wants to resume developments and put its people to work. While the stockholders were asked at their meeting on May 5 to authorize an issue of \$100,000,000 bonds, not more than \$50,000,000 of the bonds are to be issued against property now owned. Instead of mortgaging new lines as built or acquired, a general mortgage will be provided for further extensions and new lines.

UNITED RAILWAYS OF ST. LOUIS.—The Mississippi Valley Trust Co., and Francis, Brother & Co., both of St. Louis, Mo., are offering \$800,000 collateral trust 5½ per cent. notes of 1907-1909. The total authorized issue of these notes is \$1,200,000, secured by \$1,500,000 general, first mortgage 4 per cent. bonds of the company, and \$500,000 of its preferred stock. The notes are offered at 99.45, yielding 6 per cent.

VIRGINIA & SOUTHWESTERN.—See Southern Railway.